

# Revision of the *Euagathis* species (Hymenoptera: Braconidae) from Sulawesi

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The species of the genus *Euagathis* Szépligeti, 1900 (Braconidae: Agathidinae) from Sulawesi are revised and keyed. Twelve species are recognized, of which nine are new species.

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## Introduction

The Braconidae of Sulawesi (formerly Celebes: Indonesia) are hardly known and there are no reliable keys to genera and species. Members of only two subfamilies of Braconidae (viz. Braconinae and Agathidinae) are often conspicuous by their size

and colour. Two genera of the Agathidinae are common and wide-spread on Sulawesi: *Vipio* Latreille, 1805 and *Euagathis* Szépligeti, 1900. The latter genus has a Palaetropical and SE. Palaearctic distribution, with most of the species in the Indo-Australian region. The biology of Sulawesi species is unknown, but in general the Agathidinae are endoparasites of larvae of Lepidoptera living more or less in concealment. Some species of the genus *Euagathis* Szépligeti have been reared as larval parasites of Tortricidae. The key to *Euagathis* species published by Bhat & Gupta (1977), proved to be unreliable for the few Sulawesi species described, and a new key has been made. All but one of the new taxa described in this paper were collected by the junior author during his stay in Sulawesi in 1985, partly as a participant in "Project Wallace", and in 1989. Mr. R.V. Hensen collected additional specimens during his visit to Sulawesi in 1988. In a forthcoming paper the junior author will give a key to the genera of Indo-Australian Agathidinae and the full synonymy of the genera occurring in this area.

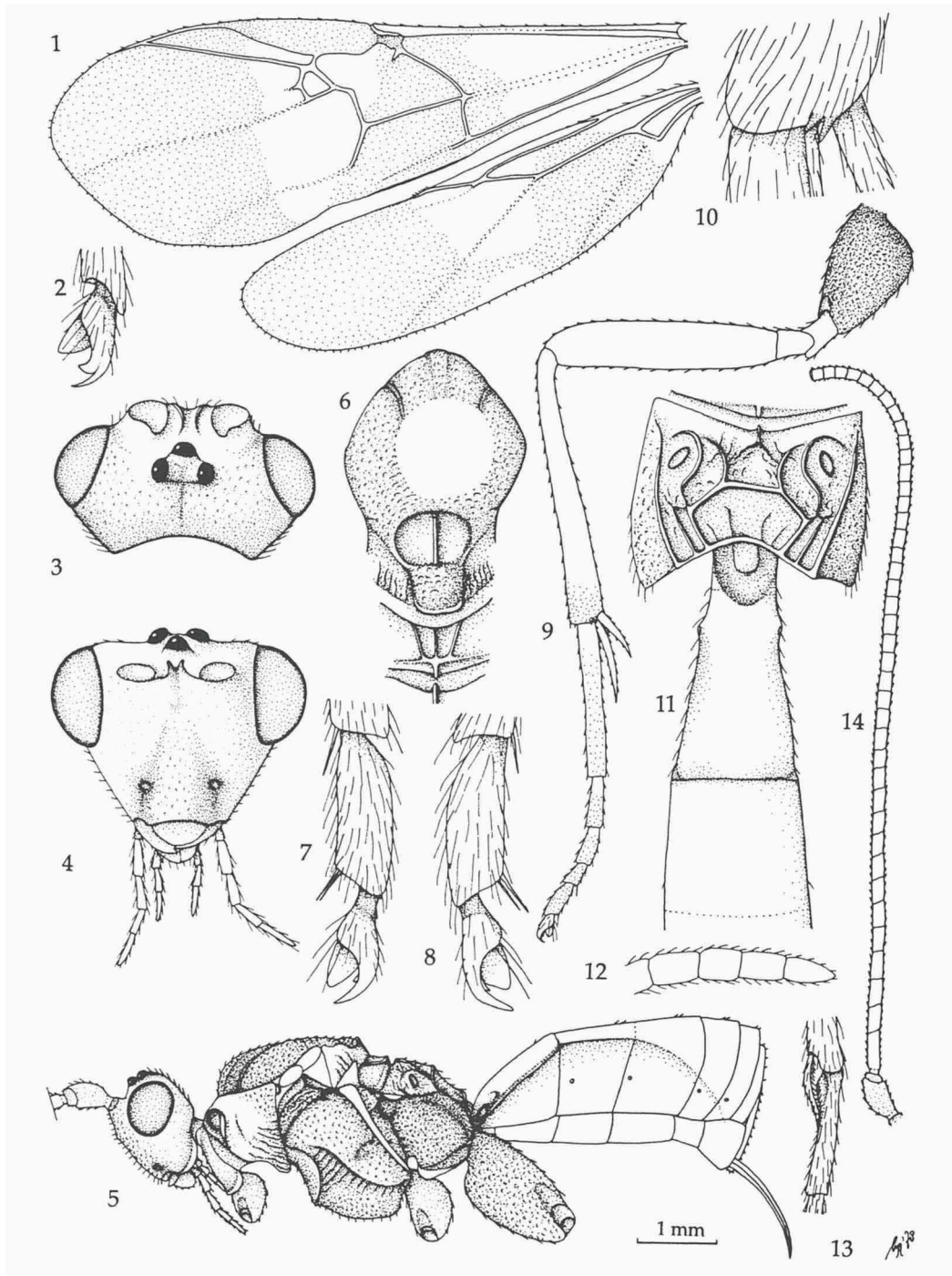
For the terminology used in this paper, see van Achterberg (1988: 5-11).

### Genus *Euagathis* Szépligeti, 1900

*Euagathis* Szépligeti, 1900:62; Shenefelt, 1970:408; Bhat & Gupta, 1977:183.

Type-species: *Euagathis bifasciatus* Szépligeti, 1900 (designated by Viereck, 1914).

**Diagnosis.**—Head distinctly elongated ventrally (figs. 4, 5); antenna distinctly longer than body, with 42-60 segments, its apex acute and without apical spine (figs. 12, 14); scapus punctulate; clypeus normal (fig. 4); labio-maxillary complex not enlarged (fig. 5); area between antennal sockets with a pair of crests (figs. 3, 27, 61); area behind antennal sockets slightly depressed only (figs. 3, 17, 27); frons without lateral carinae (figs. 3, 27), at most with pair of non-carinate elevations; stemmaticum not or moderately protruding (figs. 4, 16, 33, 36, 41, 49, 52); antennal sockets without high lamellae, but with pair of lamellae between antennal sockets (figs. 3, 40); malar suture and subocular groove absent; malar space distinctly longer than basal width of mandible (fig. 33); epomia single or double; subpronope deep (figs. 5, 28); pronope absent (fig. 27) or present (fig. 23); prepectal carina complete and evenly curved (fig. 5); mesopleuron shiny and more or less punctate (figs. 5, 18, 34); precoxal sulcus present and (largely) crenulate or costate (figs. 5, 18, 34); middle lobe of mesoscutum often with pair of shallow longitudinal depressions anteriorly (figs. 6, 65, 74, 78); notauli present (fig. 78), but sometimes shallow (fig. 74); scutellum with crescentic elevation subposteriorly (figs. 6, 20, 31); metapleuron and propodeum normally setose (fig. 34) or conspicuously pilose (fig. 18); propodeal spiracle large and elliptical (fig. 11); propodeum (partly) areolate and costulae usually (largely) present (fig. 11); vein r-m of fore wing present; second submarginal cell of fore wing without (fig. 54) or with a short to medium-sized ramellus (figs. 1, 24, 46); veins SR1, m-cu, M+CU1 and CU1 of fore wing present, but vein 1-SR+M (largely) absent (figs. 1, 24); vein r emitted near basal 0.4 of pterostigma (figs. 1, 24); vein M+CU of hind wing shorter than vein 1-M (figs. 1, 24, 32); fore tarsal claw bifurcate, its inner tooth large (fig. 2); all middle and hind tarsal claws similar, with small inner tooth (figs. 7, 8); fore tibial spur without long glabrous apical spine and about 0.7 times fore basitarsus (fig. 13); length of inner middle spur 0.3-0.6 times middle basitarsus; outer face of



Figs. 1-14, *Euagathis bifasciatus* Szépligeti, ♀, holotype, but 13 of ♀ from New Guinea, Bernhard Camp. 1, wings; 2, inner fore claw; 3, head, dorsal aspect; 4, head, frontal aspect; 6, thorax, dorsal aspect; 7, inner hind claw; 8, outer hind claw; 9, hind leg; 10, apex of hind tibia, outer aspect; 11, propodeum, first and second metasomal tergites, dorsal aspect; 12, apex of antenna; 13, fore tibial spur; 14, antenna. 1, 5, 9, 14: scale-line (=1 ×); 2, 7, 8, 10, 12: 5 ×; 3, 4, 6, 11, 13: 2 ×.



Fig. 15. Distribution of *Euagathis* species in Sulawesi and Halmahera: 1 = *E. subpilosa* spec. nov.; 2 = *E. rufoscapa* spec. nov.; 3 = *E. vermiculata* spec. nov.; 4 = *E. punctata* Szépligeti; 5 = *E. minuta* spec. nov.; 6 = *E. paraminuta* spec. nov.; 7 = *E. flava* Szépligeti; 8 = *E. magnifica* spec. nov.; 9 = *E. fuscinervis* spec. nov.; 10 = *E. forticarinata* (Cameron); 11 = *E. elevatus* Bhat & Gupta; 12 = *E. lorensis* spec. nov.; 13 = *E. flavicornis* spec. nov.

middle tibia without submedial pegs, only with 1-3 apical pegs (fig. 10); hind trochantellus with its lower edges rounded, without ventral carinae; first metasomal tergite without lateral depressions or depressions slightly developed (figs. 11, 47), but sometimes distinctly depressed (fig. 26), its length 1.2-2.4 times its apical width, and laterope present (fig. 5); first-third tergites smooth, but first tergite partly sculptured in *E. rufoscapa* (fig. 26); second metasomal suture at most slightly impressed dorsally (fig. 11); ovipositor short, moderately slender and curved downwards (fig. 5); ovipositor sheath subparallel-sided, apically subtruncate, and glabrous ventrally (figs. 30, 55, 63, 70), and about as long as apical height of metasoma (fig. 5); hypopygium medium-sized (fig. 5).

### Distribution of the genus *Euagathis* in Sulawesi

The species of the genus *Euagathis* Szépligeti belong to two groups: one confined to evergreen multistrated (rain)forest and containing species with (nearly) completely dark brown wings and metasoma black. The other group occurs in large open spots in the forest, in open areas along rivers, in forest with many bamboo, shrubs and low trees, along road-sides and in secondary habitats. Its members have the wings partly yellowish or subhyaline and the metasoma (largely) yellowish.

The distribution of the species collected in Sulawesi is given in fig. 15. The only species known to occur also outside Sulawesi (*E. forticarinata* (Cameron)) occurs probably all over Sulawesi because it occurs in secondary habitats and seems to follow human habitation. The fauna of North Sulawesi is partly similar to the fauna of Central Sulawesi (both western (near Palu) and eastern (near Luwuk) parts). The fauna of the southeastern arm of Sulawesi contains at least one species of *Euagathis* not encountered in North or Central Sulawesi. Also of other genera of Agathidinae several species found in Southeast Sulawesi were not encountered in other parts of Sulawesi visited. The southwestern arm of Sulawesi has not been investigated yet, but a few accidental finds of other genera of Agathidinae indicate partly a relationship with the southeastern arm of Sulawesi.

### Key to species of the genus *Euagathis* Szépligeti from Sulawesi

1. Wings completely dark brown (figs. 24, 32); length of fore wing 12-15 mm; hind legs, metasoma and propodeum completely black..... 2
- Wings at least basally yellowish (figs. 46, 54, 62); if (nearly) completely dark brown or with only small part yellowish (fig. 44), then fore wing about 7 mm; hind legs, metasoma and propodeum reddish, yellowish or more or less (especially hind legs) dark brown; if exceptionally metasoma largely black, then propodeum and base of hind tibia largely brownish or complete hind leg dark brown..... 5
2. Stemmaticum not protruding between posterior ocelli in lateral view (figs. 16, 22, 29); eyes comparatively large (figs. 16, 25); occipital flange wide and rather angularly protruding (figs. 16, 25); scapus reddish-brown; vertex largely smooth (figs. 17, 27); mesoscutum distinctly tuberculate (figs. 19, 28) and with two short longitudinal depressions anteriorly (fig. 21)..... 3

- Stemmaticum protruding between posterior ocelli in lateral view (figs. 36, 41); eyes smaller (fig. 33); occipital flange less developed and less protruding (fig. 33); scapus dark brown or black; vertex coarsely sculptured (figs. 35, 40); mesoscutum less tuberculate (fig. 38) and without pair of anterior depressions (figs. 39, 42) ..... 4
- 3. Metapleuron, and to a lesser degree epipleuron of second metasomal tergite, densely yellowish pubescent (fig. 18); pronope present (fig. 21); area between lamellae connected to antennal sockets narrow (fig. 17); scutellum with short longitudinal carina medio-posteriorly (fig. 20); epomia double (fig. 19); precoxal sulcus widely crenulate (fig. 18) ..... *E. subpilosa* spec. nov.
- Metapleuron and epipleuron of second tergite normally setose (cf. fig. 34); pronope absent (fig. 27); area between lamellae connected to antennal sockets comparatively wide (fig. 27); scutellum without longitudinal carina posteriorly (fig. 31); epomia single (fig. 28); precoxal sulcus comparatively narrow, with shorter crenulae (cf. fig. 34) ..... *E. rufoscapa* spec. nov.
- 4. Vertex black, and rugose-vermiculate (fig. 35), and with small triangular depression behind stemmaticum (fig. 35); stemmaticum more protruding in lateral view (fig. 36); mesoscutum blackish, strongly vermiculate, and with rather deep posterior depression (fig. 39); occipital flange comparatively narrow (fig. 33); crenulae of precoxal sulcus very short (fig. 34) ..... *E. vermiculata* spec. nov.
- Vertex dark reddish-brown, punctate or rugose and at most with linear depression behind stemmaticum (fig. 40); stemmaticum less protruding in lateral view (fig. 41); mesoscutum (dark) reddish-brown, rugose, and with comparatively weak depression (fig. 42); occipital flange comparatively wide; precoxal sulcus with somewhat longer crenulae ..... *E. punctata* Szépligeti
- 5. Metasoma blackish or dark brown; vertex largely or completely black; hind femur dark brown; length of fore wing 7-8 mm; fore wing almost entirely brown, but basal fifth subhyaline or yellowish (figs. 44, 46); second submarginal cell with ramellus (figs. 44, 46) ..... 6
- Metasoma yellowish; vertex reddish, yellowish, or with black pattern restricted; hind femur reddish to yellowish; length of fore wing more than 7.5 mm; at least basal 0.4 of fore wing yellowish (figs. 54, 66); ramellus of second submarginal cell absent or nearly so (figs. 54, 69), except in *E. flava* (fig. 62) ..... 7
- 6. Scutellum with deep subparallel-sided depression medially, anteriorly bordered by strong carina (fig. 45); head (except dorsally) and thorax yellowish-brown; face punctulate; area between ocelli and eyes largely smooth; ocelli protruding above stemmaticum (fig. 49); mesoscutum largely smooth medially; base of hind tibia pale yellowish; hind leg robust (fig. 51) ..... *E. minuta* spec. nov.
- Scutellum weakly convex medially, coarsely punctate, and anteriorly without carina; head and thorax completely black; face and area between ocelli and eyes coarsely punctate; ocelli not protruding above stemmaticum (fig. 52); mesoscutum coarsely punctate-vermiculate medially; base of hind tibia largely dark brown; hind leg slender (fig. 50) ..... *E. paraminuta* spec. nov.
- 7. Apical 0.6 of fore wing of female largely dark brown, and without separate parastigmal spot (figs. 54, 62, 66), male has paler wings and parastigmal spot indistinct (fig. 69); notauli and mesoscutum entirely smooth, with or without posterior depression (fig. 65) ..... 8

- Apical 0.2-0.4 of fore wing of female largely dark brown, remainder of wing yellowish and with a separate parastigmal spot (figs. 71, 76, 77, 79), but less separated in *E. flavicornis* (figs. 83, 86); mesoscutum with or without posterior depression, but notauli frequently with microcrenulae and/or crenulae near depression (figs. 74, 78) ..... 10
- 8. Scutellum with distinct transverse carina anteriorly and longitudinal carinae (sub)laterally (figs. 57, 64); apical half of hind wing dark brown (figs. 54, 62); fore wing comparatively wide (figs. 54, 62); ramellus of second submarginal cell of fore wing present (fig. 62) or absent (fig. 54); apex of hind tibia yellow; ovipositor sheath rather stout (figs. 55, 63); length of hind femur about 4 times its width (fig. 60) ..... 9
- Scutellum without anterior and (sub)lateral carinae (fig. 68); only apical rim of hind wing infuscated (figs. 66, 69); fore wing more elongate (figs. 66, 69); second submarginal cell of fore wing without ramellus; apex of hind tibia dark brown; ovipositor sheath comparatively slender (fig. 70); length of hind femur 6.4-7.0 times its width ..... *E. fuscineris* spec. nov.
- 9. Hind tarsus yellow; second submarginal cell of fore wing with distinct ramellus (fig. 62); carinae of scutellum regular, laterally situated (fig. 64). *E. flava* Szépligeti
- Hind tarsus largely dark brown; second submarginal cell of fore wing without ramellus (fig. 54); carinae of scutellum irregular, partly on disk of scutellum (fig. 57) ..... *E. magnifica* spec. nov.
- 10. Antennae dark brown; dark coloration of wings comparatively light and nearly greyish (figs. 71, 76); lateral lobes of mesoscutum usually largely smooth, but sometimes distinctly sculptured (fig. 74); medio-posterior depression of mesoscutum comparatively shallow or absent (fig. 74) ..... 11
- Antennae yellow; dark coloration of wings usually more intense (figs. 77, 79, 83, 86); lateral lobes of mesoscutum distinctly sculptured (fig. 78); medio-posterior depression of mesoscutum comparatively deep (fig. 78) ..... 12
- 11. Parastigmal spot of fore wing large, close to vein CU1 posteriorly, and usually apical two-fifths of marginal cell infuscated (fig. 76); apical infuscated part of fore wing usually ends far from second submarginal cell (fig. 76); length of first metasomal tergite 1.8-1.9 times its apical width; scutellum weakly convex, usually without anterior carina and consequently its anterior border rounded (fig. 73) ..... *E. forticarinata* (Cameron)
- Parastigmal spot of fore wing smaller, remains far removed from vein CU1, and apical two-thirds of marginal cell infuscated (fig. 71); apical infuscated part of fore wing almost reaching second submarginal cell (fig. 71); length of first tergite about 1.4 times its apical width; scutellum slightly concave, with anterior carina distinct and its anterior border angulate (fig. 72); (Halmahera) ..... [*E. elevatus* Bhat & Gupta]
- 12. Parastigmal spot of fore wing small, posteriorly only apical 0.2-0.3 of marginal cell dark brown, and apical infuscated part of fore wing ends far from second submarginal cell (figs. 77, 79); malar space of male 0.9 times maximal width of eye in lateral view; hind tarsus reddish-brown ..... *E. lorensis* spec. nov.
- Parastigmal spot of fore wing large, posteriorly apical 0.8 of marginal cell dark brown, and apical infuscated part of fore wing almost reaching second submarginal cell (figs. 83, 86); malar space of male 0.7 times maximal width of eye in lateral view; hind tarsus reddish-yellow ..... *E. flavicornis* spec. nov.

***Euagathis elevatus* Bhat & Gupta, 1977**  
(figs. 71, 72)

*Euagathis elevatus* Bhat & Gupta, 1977:198-199.

Material.— Holotype, ♀ (CNC), "Halmahera I., 500 m, Tolewang, x.1951, Wegener", "Holotype, *Euagathis elevatus*, 1975, Bhat & Gupta", "Holotype *Euagathis elevatus*, C.N.C. No 15622", "*elevatus* K6".

Holotype, ♀, length of fore wing 8.5 mm, of body 8.0 mm.

Head.— Antennal segments 43, length of third segment 1.3 times fourth segment, length of third, fourth and penultimate segments 2.8, 2.1 and 1.6 times their width, respectively; length of maxillary palp about 0.7 times height of head; length of eye in dorsal view 1.6 times temple; POL:diameter of ocellus:OOL = 3:3:7; face finely punctate, vertex punctulate, area behind antennal sockets not depressed, black patch rectangular, extending from stemmaticum to antennal sockets; occipital flange large.

Mesosoma.— Length of mesosoma 1.4 times its height; pronotal sides punctate, with slight crenulation anteriorly below subpronope; subpronope deep and epomia double; area above precoxal sulcus finely punctate, and coarsely punctate below it; precoxal sulcus with short and narrow crenulae; mesoscutum punctulate, moderately tuberculate, and not depressed medio-posteriorly; notauli distinct with microcrenulae in their posterior part; scutellum slightly concave, rugulose, with posterior depression and anterior edges angulate (fig. 72), distinct carinae present all around its edges and medio-posteriorly.

Wing.— Fore wing: second submarginal cell quadrangular; apical two-thirds of marginal cell infuscated; parastigmal spot small (fig. 71);  $r:3-SR:SR1 = 3:3:39$ ;  $SR1$  straight;  $2-SR:3-SR:r-m = 6:3:6$ ;  $cu-a$  interstitial. Hind wing:  $M+CU:1-M = 19:28$ .

Legs.— Length of hind femur, tibia and basitarsus 3.4, 7.2 and 7.8 times their width, respectively; length of outer and inner spurs of middle tibia 0.4 and 0.6 times middle basitarsus, respectively; length of outer and inner spurs of hind tibia 0.4 and 0.6 times hind basitarsus, respectively.

Metasoma.— Smooth; length of first tergite 1.4 times its apical width; ovipositor sheath rather wide, its length 0.08 times fore wing.

Colour.— Yellowish-brown; apical 0.4 of fore wing dark brown, and remainder yellowish; parastigmal spot brownish; pterostigma dark brown; apical 0.1 of hind wing dark grey, remainder whitish-yellow; antennae and scapus black; head and body largely yellowish-brown, except black pattern near stemmaticum, and distinct infuscation of hind tarsi and basal third of hind tibia.

***Euagathis flava* Szépligeti, 1902**  
(figs. 62-64)

*Euagathis flava* Szépligeti, 1902: 68; Szépligeti, 1904: 123; Shenefelt, 1970: 411.

Material.— Holotype, ♀ (TMA), "Celebes, Minahassa", "77b11", "*flavus* det. Szépligeti", "Holotypus *Euagathis flava* Szépligeti 1902, det. Papp 1967", "Hym. Typ. No. 723, Museum Budapest".

Holotype, ♀, length of fore wing 16 mm, of body about 13 mm.

Head.— Antennal segments 60, length of third segment 1.1 times fourth segment, length of third, fourth and penultimate segments 2.7, 2.3 and 1.6 times their



width, respectively; length of maxillary palp 0.6 times height of head; length of eye in dorsal view 2.0 times temple; POL:diameter of ocellus:OOL = 7:5:17; face rather convex, and punctate; vertex punctulate; depression behind antennal sockets very shallow, occipital flange large.

**Mesosoma.**— Length of mesosoma 1.4 times its height; pronotal sides punctulate anteriorly and distinctly crenulate posteriorly; subpronope deep, and epomia single; area above precoxal sulcus punctulate, and coarsely punctate below it; crenulae of precoxal sulcus short and precoxal sulcus rather shallow anteriorly; mesoscutum punctate, without medio-posterior depression, and its middle lobe with two very shallow depressions medio-anteriorly (fig. 65); notauli shallow, and without micro-crenulae; scutellum convex and slightly depressed posteriorly, distinctly carinated laterally and with short longitudinal carina posteriorly (fig. 64); metapleuron punctate; propodeum areolated, but areolation somewhat less posteriorly.

**Wings.**— Fore wing: rather wide, without parastigmal spot (fig. 62); marginal cell entirely infuscated; second submarginal cell subpentagonal with distinct ramellus;  $r:3-SR:SR1 = 5:3:75$ ;  $SR1$  slightly curved basally;  $2-SR:3-SR:r-m = 10:3:7$ . Hind wing:  $2-CU$  present and unsclerotized,  $M+CU:1-M = 1:2$ .

**Legs.**— Length of hind femur, tibia and basitarsus 3.8, 8.6 and 9.2 times their width, respectively; length of outer and inner spurs of middle tibia 0.4 and 0.6 times their basitarsus, respectively; length of outer and inner spurs of hind tibia 0.3 and 0.6 times their basitarsus, respectively.

**Metasoma.**— Smooth; length of first tergite about 1.5 times its apical width; ovipositor sheath rather wide (fig. 63), and its length 0.06 times fore wing.

**Colour.**— Largely yellowish-brown, but antennae dark brown; base of hind trochantellus and apex of hind femur infuscated; apical 0.6 of fore wing and apical 0.5 of hind wing brown, and remainder yellowish; veins yellowish-brown (membrane yellowish) to infuscated (membrane brown).

***Euagathis flavicornis* spec. nov.**  
(figs. 83-86)

**Material.**— Holotype, ♀ (RMNH), "Indonesia: N. Sulawesi, Dumoga-Bone N.P., ca 220 m, Mal. trap: Maze Toraut R., 16-23.xi.1985, 0°34'N 123°54'E., C.v.Achterberg, RMNH'86". Paratypes: 1 ♀ + 1 ♂; 1 ♀ (MZB), topotypic and same date; 1 ♂ (RMNH), "RMNH-Project Wallace, Indonesia, N. Sulawesi, 20-26.iv.1985, R. de Jong, J. v.Tol", "Dumoga-Bone N.P. betw. Sg. Toraut & Sg. Tumpah, 220-500 m, 0°34-35'N 123°52-54' E., multistr. evergr. forest".

Holotype, ♀, length of fore wing 9.8 mm, of body about 10 mm.

**Head.**— Antennal segments 55, length of third segment 1.1 times fourth segment, length of third, fourth and penultimate segments 3.0, 2.8 and 1.1 times their width, respectively; length of maxillary palp 0.8 times height of head; length of eye in dorsal view 2.3 times temple; POL:diameter of ocellus:OOL = 3:3:8; face punctate; vertex punctulate; depression behind antennal sockets very shallow; occipital flange large.

**Mesosoma.**— Length of mesosoma 1.3 times its height; sides of pronotum sparsely punctate anteriorly, and distinctly crenulated postero-ventrally; subpronope large and epomia single; area above precoxal sulcus punctate, and coarsely punctate below it; precoxal sulcus with short crenulae, and rather weakly impressed posteri-

orly; mesoscutum punctate, with deep depression medio-posteriorly and rugae towards the depression, and middle lobe with two almost groove-like longitudinal depressions anteriorly; notauli deep, microcrenulation obsolescent; scutellum punctate, with depression posteriorly and convex anteriorly, laterally with some rugulae, anterior and posterior carinae very distinct (fig. 84); metapleuron punctate, propodeum areolated but its posterior part somewhat less areolated.

Wings.— Fore wing: second submarginal cell subpentagonal, without ramellus; parastigmal spot large, its surrounding infuscation almost touching vein 2-CU1 posteriorly (figs. 83, 86);  $r:3-SR:SR1 = 4:2:51$ ; SR1 straight;  $2-SR:3-SR:r-m = 10:2:7$ ; cu-a interstitial and slightly curved basally. Hind wing:  $M+CU:1-M = 19:39$ .

Legs.— Length of hind femur, tibia and basitarsus 5.7, 10.3 and 9.8 times their width, respectively; length of outer and inner spurs of middle tibia 0.3 and 0.9 times their basitarsus, respectively; length of outer and inner spurs of hind tibia 0.3 and 0.5 times hind basitarsus.

Metasoma.— Smooth, yellow; length of first tergite 2.2 times its apical width; ovipositor sheath slender (fig. 85), and its length 0.11 times fore wing.

Colour.— Largely yellowish-brown; sides of metasoma pale yellowish-brown, base of hind trochantellus and apex of hind femur distinctly infuscated, remainder of body yellowish-brown; apical 0.35 of fore wing and apical 0.4 of hind wing dark brown, apical 0.8 of marginal cell infuscated; remainder of wing's membrane yellowish; pigmentation of veins similar to pigmentation of membrane.

Variation.— Paratype (female): length of fore wing 10.2 mm, length of ovipositor sheath 0.11 times fore wing, antennal segments 55, length of hind femur 9.0 times its width, length of outer and inner spurs of middle (and hind) tibia 0.5 and 0.3 times their basitarsus. Paratype (male): length of fore wing 10.7 mm, remaining antennal segments 34, length of hind femur 5.2 times its width; length of outer and inner spurs of middle tibia 0.6 and 0.4 times their basitarsus, respectively; length of outer and inner spurs of hind tibia 0.4 and 0.3 times their basitarsus, respectively; length of malar space 0.7 times maximal width of eye in lateral view; apical 0.7 of marginal cell infuscated; parastigmal spot and its surrounding infuscation of fore wing larger than in female, reaching far beyond vein 2-CU1 (fig. 86); apical 0.5 of hind wing infuscated; infuscation on wings in general paler than of female.

### *Euagathis forticarinata* (Cameron, 1899)

(figs. 73-76)

*Agathis forticarinata* Cameron, 1899: 86-87 [examined].

*Euagathis forticarinata*; Baltazar, 1963:3; Shenefelt, 1970: 411; Bhat & Gupta, 1970: 216-218.

*Agathis lepcha* Cameron, 1907: 113.

*Euagathis lepcha*; Shenefelt, 1970: 411; Bhat & Gupta, 1970: 217.

*Euagathis pallida* Fullaway, 1919: 51; Baltazar, 1966: 218; Shenefelt, 1970: 413. *Syn. nov.*

Material.— Holotype of *E. pallida*, ♀ (BPBM), "Makassar, Celebes, F. Muir, Dec. 1908", "Type *Eugathis pallida*"; 1 ♀ + 1 ♂ (RMNH), "Indonesia: C. Sulawesi, Lore-Lindu N.P., ca 975 m, 1°15'S 120°20'E, 9.xii.1985, nr Dongi-Dongi shelter, C.v.Achterberg, RMNH'86"; 2 ♂♂ (RMNH, MZB), topotypic but 11.xii.1985; 1 ♂ (RMNH), topotypic, at light, 3.xii.1985; 2 ♂♂ (RMNH), topotypic, but collected 7.xii and 10.xii.1985, respectively; 1 ♀ + 7 ♂♂ (RMNH), "Indonesia: C. Sulawesi, nr Luwuk, Salodik, 300-400 m, 31.x.-3.xi.1989, C. van Achterberg & M. Tulung, RMNH'89"; 1 ♀ + 5 ♂♂ (RMNH), "Indonesia: C. Sulawesi, nr Batui, Seseba-Siku, 50-75 m, 24.x-6.xi.1989, C. van Achterberg & M. Tulung, RMNH'89"; 1 ♂ (RMNH), "Indonesia: C. Sulawesi, nr Luwuk, Bunga, c. 300 m, 21.x.1989, RMNH, C. van Achterberg"; 4 ♀♀ (RMNH), "Indonesia: SE. Sulawesi, nr Sanggona, Mt. Watuwila Base Camp, c. 200 m, 14.x.1989, RMNH'89, C. van Achterberg".

Holotype, ♀, length of fore wing 8 mm, of body 7.4 mm.

Head.— Antennal segments 54, length of third segment 1.1 times fourth segment, length of third, fourth and penultimate segments 3.3, 3.0 and 1.2 times their width, respectively; length of maxillary palp 0.8 times height of head; length of eye in dorsal view 2.6 times temple; POL:diameter of ocellus:OOL = 3:2:7; face rather convex, and finely punctate, vertex punctulate; depression behind antennal sockets very shallow; occipital flange comparatively narrow.

Mesosoma.— Length of mesosoma 1.3 times its height; pronotal sides sparsely punctate with posterior distinct crenulation; subpronope deep and epomia single; mesopleuron above precoxal sulcus punctate, coarsely punctate below it; crenulae of precoxal sulcus short and narrow; mesoscutum punctate, without (or with shallow) depression medio-posteriorly, middle lobe with two longitudinal depressions anteriorly (figs. 74); notauli with distinct crenulation posteriorly, which is much stronger towards confluence of notauli (fig. 74); scutellum punctate, rather convex, its anterior edges rounded (figs. 73, 75), with a carina and a rather narrow depression posteriorly, and without anterior or lateral carinae; metapleuron punctate; propodeum areolated, but very sparsely posteriorly.

Wings.— Fore wing: apical 0.45 of marginal cell infuscated, second submarginal cell quadrangular; parastigmal spot large, and posteriorly almost touching 2-CU1 (fig. 76); r:3-SR:SR1 = 6:5:72; SR1 straight; 2-SR:3-SR:r-m = 10:5:9; Hind wing: M+CU:1-M = 14:26.

Legs.— Length of hind femur, tibia and basitarsus 5.6, 8.3 and 9.5 times their width, respectively; length of outer and inner spurs of middle (and hind) tibia 0.4 and 0.6 times their basitarsus, respectively.

Metasoma.— Smooth, yellowish-brown; length of first tergite 1.8 times its apical width; ovipositor sheath slender, and its length 0.09 times fore wing.

Colour.— Yellowish-brown; antennae brown; scapus, face and mesosoma (dorsally) dark yellowish-brown; mesosoma latero-ventrally and metasoma yellowish-brown; base of tibia and all tarsi dark reddish-brown; apical 0.25 of fore wing dark brown, pattern of infuscation ending distinctly far from second submarginal cell, and remainder of wing yellowish (fig. 76); apical 0.13 of hind wing brownish, and remainder yellowish.

Variation.— Antennal segments 58 (1 ♀), 55 (1 ♂), 54 (2 ♀♀, 4 ♂♂) or 53 (2 ♂♂); length of fore wing 7.6-8.6 mm, length of hind femur 4.6-5.8 times its width; length of outer and inner spurs of middle tibia 0.45-0.5 and 0.6 times middle basitarsus, respectively; length of outer and inner spurs of hind tibia 0.4 and 0.5-0.6 times hind basitarsus, respectively; length of ovipositor 0.09-0.11 times fore wing; sculpture of mesoscutum and scutellum very variable, posteriorly mesoscutum may be smooth to strongly obliquely rugose, and scutellum may be strongly punctate and with rugae anteriorly, as a result the scutellum may be comparatively angulate anteriorly, but intermediates occur.

Note.— Body coloration in *E. forticarinata* appears to be very variable; it ranges from predominantly yellowish-brown to yellow, yellowish, dark reddish-brown and brown; especially remarkable is the variability in the colour of hind legs: the brown (or dark brown) pigmentation may extend to half of the tibia and the tarsus (3 ♂♂), to the entire tibia and tarsus (2 ♂♂), or from the coxa (brownish) to apex of tarsus (1 ♂), or from the base of tibia to apex of tarsus (1 ♂). The scutellum of males is also

variable: the anterior carina may be entirely absent (3 ♂), partially present (2 ♂), or entirely present (1 ♂). Has a wide distribution; from India to Sulawesi and occurs in secondary habitats.

*Euagathis fuscinervis* spec. nov.  
(figs. 65-70)

**Material.**— Holotype, ♀ (RMNH), "Indonesia: C. Sulawesi, Lore-Lindu N.P., ca 1650 m, Lake Taming, 5-9.xii.1985, C.v.Achterberg, RMNH '86, Mal. Trap 4 (PW56)". Paratype, ♂, (RMNH), topotypic and same date.

Holotype, ♀, length of fore wing 9.6 mm, of body about 9 mm.

**Head.**— Antennal segments 55, length of third segment 1.1 times fourth segment, length of third, fourth and penultimate segments 2.8, 2.5 and 1.2 times their width, respectively; length of maxillary palp 0.7 times height of head; length of eye in dorsal view 3.0 times temple; POL:diameter of ocellus:OOL = 3.5:3:7; face punctate; vertex punctulate; depression behind antennal sockets very shallow; occipital flange large.

**Mesosoma.**— Length of mesosoma 1.3 times its height; pronotal sides punctulate anteriorly and distinct crenulate posteriorly; epomia single, and subpronope large; mesopleuron punctate; precoxal sulcus well impressed and its crenulae short; mesoscutum punctate to coarsely punctate with distinct medio-posterior depression, and middle lobe with two longitudinal depressions anteriorly (fig. 65); notauli deep, without microcrenulae; scutellum strongly convex (figs. 67, 68), coarsely punctate, and with crescentic carina posteriorly only (fig. 68); metapleuron punctate; propodeum areolated, its posterior part somewhat less.

**Wings.**— Fore wing: largely infuscated, without separate parastigmal spot; marginal cell entirely infuscated, submarginal cell subpentagonal without ramellus (fig. 66); SR1 slightly curved medially, r:3-SR:SR1 = 3:2:52; 2-SR:3-SR:r-m = 6:2:6; cu-a basally curved and slightly antefurcal. Hind wing: M+CU:1-M = 16:36.

**Legs.**— Length of hind femur, tibia and basitarsus 6.4, 10 and 9.6 times their width, respectively; length of outer and inner spurs of middle tibia 0.6 and 0.4 times middle basitarsus; length of outer and inner spurs of hind tibia 0.6 and 0.4 times their basitarsus.

**Metasoma.**— Smooth; length of first tergite 2.3 times its apical width; ovipositor sheath slender (fig. 70), and its length 0.08 times fore wing.

**Colour.**— Largely yellow and yellowish-brown; internal side scapus yellowish-brown and its external side brownish; mesoscutum, vertex, hind femur (except apical fifth), apical half of hind tibia yellowish-brown; hind coxa (external side), base of hind trochantellus, apex of hind femur, basal half of hind tibia, hind spurs and basitarsi (dark) brown; remainder of body yellow; fore wing largely infuscated, its apical 0.6 clearly dark brown; basal quarter of pterostigma clearly yellow, remainder dark brown; veins dark brown (membrane infuscated) to reddish (membrane yellowish); only apical 0.2 of hind wing infuscated.

**Variation.**— Paratype (male): length of fore wing 9.8 mm, antennal segments 56, length of hind femur 7.0 times its width, length of outer and inner spurs of middle tibia 0.6 and 0.4 times their basitarsus, respectively; length of outer and inner spurs

of hind tibia 0.5 and 0.3 times hind basitarsus; infuscated part of wing much reduced compared to female (fig. 69) and less intense in the hind wing; apical third of fore wing dark brown, remainder yellowish, and infuscation extending to apical 0.5 of marginal cell only; all veins of fore wings dark brown, especially contrasting with yellowish areas of membrane.

*Euagathis lorensis* spec. nov.  
(figs. 77-82)

**Material.**— Holotype, ♀ (RMNH), "Indonesia, C. Sulawesi, Lore Lindu N.P., ca 1100 m, 1°15'S 120°20'E, 6-9.xii.1985", "nr. Dongi-Dongi shelter, Mal. trap 6(PW58), C.v.Achterberg, RMNH '86". Paratypes, 2 ♂♂; 1 ♂, (MZB): "Indonesia, C. Sulawesi, Lore-Lindu N.P., ca 600 m, 1°14'S 120°21'E, nr Tongoa, 6.xii.1985, C.v.Achterberg, RMNH"; 1 ♂, (RMNH): topotypic, but collected by hand at ca 975 m on 7.xii.1985.

Holotype, ♀, length of fore wing 11.0 mm, of body 11.2 mm

**Head.**— Antennal segments 57, length of third segment 1.1 times fourth segment, length of third, fourth and penultimate segments 2.8, 2.8 and 1.2 times their width, respectively; length of maxillary palp 0.8 times height of head; length of eye in dorsal view 1.8 times temple; POL:diameter of ocellus:OOL = 3.5:2.5:8; face rather convex, and punctate; vertex punctulate; depression behind antennal sockets very shallow.

**Mesosoma.**— Length of mesosoma 1.2 times its height; pronotal sides sparsely punctate anteriorly, with distinct crenulation posteriorly; epomia single and sub-pronope deep; precoxal sulcus well impressed, its crenulae rather short; area below precoxal sulcus coarsely punctate, and punctate above it; mesoscutum rugose-vermiculate, with a deep vermiculate depression medio-posteriorly (fig. 78), middle lobe with two longitudinal groove-like depressions anteriorly, and lateral lobes with distinct vermiculation (figs. 78, 81); notauli well impressed, but sparsely microcrenulated; scutellum rather convex (fig. 82), punctate, distinctly depressed and carinated posteriorly, with some rugulae laterally and anteriorly (fig. 80); propodeum areolated, its areolation less intense posteriorly; metapleuron punctate.

**Wings.**— Fore wing: apical quarter of marginal cell infuscated, second sub-marginal cell subpentagonal and without ramellus; parastigmal spot small, distinctly separated from 2-CU1 (fig. 79); r:3-SR:SR1 = 6:3:110; SR1 straight; 2-SR:3-SR:r-m = 16:3:14; cu-a interstitial, slightly curved basally. Hind wing: M+CU:1-M = 19:38.

**Legs.**— Length of hind femur, tibia and basitarsus 5.5, 11.0 and 9.4 times their width, respectively; length of outer and inner spurs of middle tibia 0.45 and 0.65 times middle basitarsus; length of outer and inner spurs of hind tibia 0.3 and 0.5 times hind basitarsus.

**Metasoma.**— Smooth; length of first tergite 1.9 times its apical width; ovipositor sheath slender, and its length 0.08 times fore wing.

**Colour.**— Yellowish-brown; base of hind trochantellus and apex of hind femur distinctly infuscated, hind tarsi dark brown; sides of metasoma pale yellowish-brown; remainder of body yellowish-brown; apical 0.3 of fore wing dark brown, remainder yellowish, infuscation pattern remain distinctly away from second sub-marginal cell; apical 0.4 of hind wing dark brown, and the remainder yellowish (fig. 79).

Variation.— Paratypes: antennal segments 54 and 55, length of fore wing 9.4-9.6 mm, length of hind femur 4.8-5.7 times its width; length of outer and inner spurs of middle tibia 0.6 and 0.4 times middle basitarsus; length of outer and inner spurs of hind tibia 0.4 and 0.2-0.3 times their basitarsus, respectively; malar space 0.9 times maximal width of eye in lateral view; parastigmal spot on fore wing somewhat different shaped (longer) than in females, and infuscation pattern somewhat less extended (only apical 0.2; fig. 77).

Note.— Although the parastigmal spot on fore wing of males of *E. lorensis* may be somewhat elongated compared to spot of females, yet its size remains less compared to parastigmal spot in *E. forticarinata* and *E. flavicornis*, which have a large parastigmal spot (figs. 76, 83, 86).

***Euagathis magnifica* spec. nov.**  
(figs. 54-61)

Material.— Holotype, ♀ (RMNH), "Indonesia: C. Sulawesi, Luwuk, Hanga-Hanga Falls, c. 200 m, 23.x.1989, C. van Achterberg, J. Warouw & M. Tulung, RMNH". Collected in rather low and open deciduous forest on limestone.

Holotype, ♀, length of fore wing 13.8 mm, of body 12.3 mm.

Head.— Remaining antennal segments 31, length of third segment 1.2 times fourth segment, length of third and fourth segments 2.8 and 2.4 times their width, respectively; length of maxillary palp 0.8 times height of head; length of eye in dorsal view 2.4 times temple (fig. 61); POL:diameter of ocellus:OOL = 9:6:20; face and clypeus densely finely punctate with interspaces about equal to width of punctures, but face laterally sparsely punctate; area between antennal sockets with pair of strong convergent lamellae (fig. 61); frons smooth and slightly concave medially, and laterally sparsely punctulate; vertex sparsely punctulate, and behind stemmaticum declivous; occipital flange rather large and semicircularly protruding; ocelli protruding over stemmaticum (fig. 58).

Mesosoma.— Length of mesosoma 1.3 times its height; sides of pronotum largely smooth, dorsally punctulate and crenulate posteriorly; epomia single and subpronope deep and large (fig. 56), not bordered by a carina anteriorly; pronope absent (fig. 61); precoxal sulcus complete and costate; area below precoxal sulcus densely (with interspaces less than width of punctures) and coarsely punctate; area above sulcus largely smooth; episternal scrobe linear, deep and long; postero-ventral corner of mesopleuron rather protruding posteriorly; middle lobe of mesoscutum rather protruding (fig. 56), medially with pair of longitudinal grooves; mesoscutum rather sparsely distinctly punctate, with interspaces much wider than punctures; notauli smooth and posteriorly absent; longitudinal carina of scutellar sulcus only present posteriorly (fig. 57); scutellum nearly flat and coarsely (rugose-)punctate and with anterior and crescentic subposterior carinae, and with pair of oblique carinae sublaterally (fig. 57); propodeum coarsely areolated.

Wings.— Fore wing: second submarginal cell pentagonal and without ramellus (fig. 54); r:3-SR:SR1 = 3:1:32; SR1 nearly straight (fig. 54); 2-SR:3-SR:r-m = 5:1:4; cu-a straight and slightly antefurcal. Hind wing: M+CU:1-M = 3:5.

Legs.— Length of femur (fig. 60), tibia and basitarsus of hind leg 3.8, 7.2 and 7.8

times their width, respectively; length of outer and inner spur of middle tibia 0.4 and 0.5 times middle basitarsus, respectively; length of outer and inner spurs of hind tibia 0.3 and 0.5 times hind basitarsus, respectively.

Metasoma.— Smooth and shiny; dorsal part of first and second tergites only apically sparsely setose; length of first tergite 1.4 times its apical width; first tergite deeply concave basally; ovipositor sheath robust (fig. 55), and its length 0.05 times fore wing.

Colour.— Brownish-yellow; flagellum black; hind tarsus (except basally), pterostigma and apical 0.6 of wings largely dark brown; remainder of wings yellow; scapus slightly infuscated.

Note.— Runs in the key by Bhat & Gupta (1977) to three species: one from the Sunda area (*E. baltazarae* Bhat & Gupta, 1977) and two from the Philippines (*E. philippinensis* Bhat & Gupta, 1977 and *E. chromoptera* Roman, 1913). *E. baltazarae* has the hind tibia dark brown, the face very minutely punctate, the scutellar sulcus with one longitudinal carina, length of fore wing 8-9 mm, apical 0.75 of wings dark brown, area below precoxal sulcus minutely punctate and the notauli complete posteriorly. *E. chromoptera* Roman is much smaller (length of body about 6 mm), has vein cu-a of fore wing distinctly postfurcal, the pterostigma yellowish basally, the hind tarsus completely blackish, the wings weakly infuscated, the longitudinal carina of scutellar sulcus complete, the mesopleuron is largely smooth and the precoxal sulcus punctate only. *E. philippinensis* Bhat & Gupta has the hind leg (except coxa) blackish-brown, the mesoscutum smooth, the area below the precoxal sulcus is distinctly but sparsely punctate, the antenna basally, frons, occiput and metasoma behind the first tergite are blackish-brown.

***Euagathis minuta* spec. nov.**

(figs. 43-45, 48, 49, 51)

Material.— Holotype, ♀ (RMNH), "N. Sulawesi, 7 km N. Malibagu, ca 125 m, 0°27'N 123°58'E, 14.xi.1985, C.v.Achterberg, RMNH '86".

Holotype, ♀, length of fore wing 7.2 mm, of body 7.4 mm.

Head.— Antennal segments 42, length of third segment 1.2 times fourth segment, length of third, fourth and penultimate segments 2.4, 2.0 and 1.2 times their width, respectively; length of maxillary palp about 0.6 times height of head; length of eye in dorsal view 2.8 times temple; POL:diameter of ocellus:OOL = 3:2:7; face and vertex punctulate; ocelli protruding above stemmaticum (fig. 49); depression behind antennal sockets absent; occipital flange large.

Mesosoma.— Length of mesosoma 1.4 times its height; sides of pronotum sparsely punctate, with distinct crenulation posteriorly; epomia single and subpronoep rather small and comparatively shallow, anteriorly bordered by a carina; precoxal sulcus well impressed, with short and narrow crenulae; mesopleuron above precoxal sulcus punctate and coarsely punctate below; mesoscutum superficially punctate, but largely smooth medially and posteriorly shallowly depressed; middle lobe with pair of wide and shallow depressions anteriorly; microcrenulae only in anterior part of notauli; scutellum nearly flat and rugulose-punctate laterally (figs. 43, 45), medially with a deep, subparallel-sided depression and bordered by strong

carina anteriorly and subposteriorly; propodeum coarsely areolated, also on its posterior part.

**Wings.**— Fore wing: second submarginal cell wide pentagonal and with short ramellus;  $r:3-SR:SR1 = 3:2:32$ ;  $SR1$  straight;  $2-SR:3-SR:r-m = 11:4:10$ ;  $cu-a$  straight and slightly postfurcal;  $m-cu$  far antefurcal. Hind wing:  $M+CU:1-M = 6:11$  (fig. 44).

**Legs.**— Hind coxa robust; length of hind femur, tibia and basitarsus 3.7, 6.2 and 7.0. times their width, respectively; length of outer and inner spurs of middle tibia 0.5 and 0.6 times middle basitarsus, respectively; length of outer and inner spurs of hind tibia 0.4 and 0.6 times hind basitarsus, respectively; hind leg comparatively robust (fig. 51).

**Metasoma.**— Smooth, shiny and strongly; length of first tergite 1.2 times its apical width, and shallowly concave basally (fig. 48); ovipositor rather slender, and its length 0.09 times fore wing; all tergites with posterior band of setae (fig. 48).

**Colour.**— Blackish; vertex with rather extended black pattern; metasoma and hind coxae blackish; propodeum brownish-yellow; base of hind tibiae pale yellowish, remainder of hind leg dark brown; scapus and antennae dark brown; face, pronotum and pronotal sides, mesoscutum, scutellum, mesopleuron, fore and middle legs yellowish-brown; postero-ventral part of mesopleuron, metapleuron and propodeum brown; wings almost entirely brown, except basal fifth of fore wing (fig. 44).

***Euagathis paraminuta* spec. nov.**

(figs. 46, 47, 50, 52, 53)

**Material.**— Holotype, ♀ (RMNH), "SW. Celebes, 1600 m, G. [=Gunung] Lompobatang, vii., L.J.Toxopeus, 1936".

Holotype, ♀, length of fore wing 8.2 mm, of body 7.3 mm.

**Head.**— Antennal segments 48, length of third segment 1.1 times fourth segment, length of third, fourth and penultimate segments 2.7, 2.5 and 1.6 times their width, respectively; length of maxillary palp 0.6 times height of head; length of eye in dorsal view 2.6 times temple;  $POL:diameter\ of\ ocellus:OOL = 8:5:7$ ; face and clypeus densely punctate, medially with additional rugae, and some coarse rugae below antennal sockets; vertex including  $OOL$  coarsely punctate, slightly impressed behind antennal sockets; occipital flange rather large (fig. 53); ocelli not protruding above stemmaticum (fig. 52).

**Mesosoma.**— Length of mesosoma 1.5 times its height; sides of pronotum largely rather finely punctate, with some long rugae anteriorly and crenulate posteriorly; epomia single and subpronope deep and large, not bordered by a carina anteriorly; precoxal sulcus distinctly impressed with very strong and long crenulae; mesopleuron largely punctate above precoxal sulcus with smooth interspaces, which are wider than punctures, below sulcus very densely and coarsely punctate and interspaces shallower than punctures; middle lobe of mesoscutum rather flat and mesoscutum largely coarsely punctate-vermiculate medially, with pair of narrow rather shallow grooves anteriorly, lateral lobes largely coarsely punctate, and with distinct smooth interspaces; notauli complete and nearly complete crenulate; scutellum weakly convex medially and coarsely rugose-punctate, without depression, anteriorly without carina and crescentic carina subposteriorly evenly curved and rather weak; propo-



deum moderately areolated, but less strongly than in *E. minuta*.

Wings.— Fore wing: second submarginal cell rather narrow pentagonal and with medium-sized ramellus (fig. 46);  $r:3-SR:SR1 = 3:1:40$ ;  $SR1$  straight;  $2-SR:3-SR:r-m = 5:1:4$ ;  $cu-a$  straight and interstitial. Hind wing:  $M+CU:1-M = 7:15$ .

Legs.— Hind coxa comparatively slender (fig. 50); length of hind femur, tibia and basitarsus 5.1, 8.6 and 8.0 times their width, respectively; length of outer and inner spurs of middle tibia 0.5 and 0.6 times middle basitarsus, respectively; length of outer and inner spurs of hind tibia 0.4 and 0.6 times hind basitarsus, respectively; hind leg comparatively long (fig. 50).

Metasoma.— Smooth and strongly shiny; first and second tergites completely glabrous posteriorly; length of first tergite 2.2 times its apical width and basally deeply concave (fig. 47); ovipositor sheath rather slender, and its length 0.09 times fore wing.

Colour.— Black; antennae, tegulae, hind leg, pterostigma and veins dark brown; palpi, fore and middle legs yellowish-brown; wing membrane dark brown but below pterostigma and basal 0.4 of hind wing subhyaline and basal quarter of fore wing largely pale brownish.

Note.— The new species runs in the key by Bhat & Gupta (1977) to *Euagathis rotundus* Bhat & Gupta, 1977 from the Philippines, but *rotundus* has the middle lobe of mesoscutum distinctly raised and has the mesoscutum and the propodeum yellowish. It is closer related to *E. nigris* Bhat & Gupta, 1977 also from the Philippines, but *nigris* has the crescentic carina of scutellum notched medially, notauli shallow and propodeum weakly areolated.

### *Euagathis punctata* Szépligeti, 1902

(figs. 40–42)

*Euagathis punctata* Szépligeti, 1902: 69; Shenefelt, 1970: 414 (lectotype designation); Bhat & Gupta, 1977: 213–214.

Material.— Lectotype, ♀ (TMA), "Celebes, Minahassa", "Getotes", "*punctatus*, det. Szépligeti", "728b", "Lectotypus, ♀, *Euagathis punctata* Szépl., 1902, det. Papp'67", "Hym. Typ. No 731, Museum Budapest"; 1 ♂ (RMNH), "Dr. W. Kaudara, N. Celebes, 1917"; 1 ♀ + 2 ♂♂ (RMNH), "Indonesia: C. Sulawesi, Lore-Lindu N.P., ca 1000 m, 1°15'S 120°20'E, 4-9.xii.1985 (♀, Malaise trap 1, PW 53) or 4 and 7.xii.1985, nr Dongi-Dongi shelter, C.v.Achterberg, RMNH '86"; 2 ♂♂ (RMNH, MZB), "Indonesia: N. Sulawesi, Dumoga-Bone N.P., ca 220 m, nr Base Camp Toraut R., 0°34'N 123°54'E, 22.xi.1985, C.v.Achterberg, RMNH '86"; 1 ♀ + 1 ♂ (RMNH), "Indonesia: C. Sulawesi, nr Luwuk, Salodik, 300–400 m, 1-3.xi.1989, C. van Achterberg & M. Tulung, RMNH'89"; 1 ♀ (RMNH), "Indonesia: C. Sulawesi, nr Luwuk, Salodik-Lenyek, c. 500 m, 22.x.1989, C. van Achterberg & J. Warouw, RMNH'89". All five males collected by hand when flying fast, at a sunny spot in the forest.

Holotype, ♀, length of fore wing 12.6 mm, of body 14.5 mm.

Head.— Antennal segments 54, length of third segment 1.2 times fourth segment, length of third, fourth and penultimate segments 2.7, 2.5 and 1.2 times their width, respectively; length of maxillary palp 0.6 times height of head; length of eye in dorsal view 1.8 times temple; POL:diameter of ocellus:OOL = 4:2:10; face flat, finely punctate, and with some very fine vertical striae; depression behind antennal sockets almost absent; vertex rugoso-punctate (fig. 40); stemmaticum moderately protruding (fig. 41); occipital flange rather narrow.

**Mesosoma.**— Length of mesosoma 1.3 times its height; sides of pronotum at most punctulate, with small strigose area below epomia and distinctly crenulated posteriorly; epomia single, and subpronope small; mesoscutum rugose-punctate (fig. 42), and with depression medio-posteriorly, notauli deep and crenulated; scutellum rugose-punctate and marginally carinated; sides of mesoscutum coarsely punctate, precoxal sulcus well impressed, and its crenulae comparatively short and narrow; metapleuron normally pilose, rugose-punctate antero-ventrally, and remainder coarsely punctate; propodeum areolated, but somewhat less strongly posteriorly.

**Wings.**— Fore wing: second submarginal cell sub-pentagonal; marginal cell entirely infuscated;  $r:3-SR:SR1 = 4:3:71$ ;  $SR1$  slightly curved medially;  $2-SR:3-SR:r-m = 10:3:9$ ;  $cu-a$  interstitial and slightly curved basally. Hind wing: 2-CU present and unsclerotized;  $SR$  slightly curved basally;  $M+CU:1-M = 17:41$ .

**Legs.**— Length of hind femur, tibia and basitarsus 5.5, 9.0 and 11.0 times their width, respectively; length of outer and inner spurs of middle tibia 0.4 and 0.6 times their basitarsus, respectively; length of outer and inner spurs of hind tibia 0.3 and 0.5 times hind basitarsus, respectively.

**Metasoma.**— Smooth, shiny; length of first tergite 2.2 times its apical width; length of ovipositor sheath 0.06 times fore wing.

**Colour.**— Black; wings, antennae and scapus dark brown; face, vertex, pronotum and pronotal sides, mesoscutum and scutellum, mesopleuron, middle and fore legs largely dark reddish-brown; propodeum, metasoma, hind coxae and legs black.

**Variation.**— Length of fore wing of female 12.6–14.0 mm, length of hind tibia 5.5–6.0 times its width; length of fore wing of male 13.7–14.6 mm, length of outer and inner spurs of middle tibia 0.4 and 0.5–0.6 times their basitarsus, respectively; length of outer and inner spurs of hind tibia 0.3 and 0.5 times hind basitarsus, respectively.

### ***Euagathis rufoscapa* spec. nov.**

(figs. 24–31)

**Material.**— Holotype, ♀ (RMNH), "Indonesia: SE. Sulawesi, c. 100 m, sandy river bank, 11.x.1989, C. van Achterberg, RMNH". Paratypes: 3 ♀♀ (RMNH, MZB); 2 ♀♀, "Indonesia: SE. Sulawesi, nr Sanggona, Mt. Watuwila Base Camp, c. 200 m, 15.x.1989, RMNH'89, C. van Achterberg"; 1 ♀, "Indonesia: C. Sulawesi, nr Luwuk, Salodik, c. 400 m, 19.x.1989, C. van Achterberg & J. Warouw, RMNH'89". The holotype and the paratype from Salodik were collected flying at the border of rainforest, both other paratypes were collected inside a somewhat distorted part of evergreen rainforest.

Holotype, ♀, length of fore wing 13.5 mm, of body 12.7 mm.

**Head.**— Antennal segments 54, length of third segment 1.2 times fourth segment, length of third, fourth and penultimate segments 3.2, 2.6, and 1.3 times their width, respectively; length of maxillary palp 0.8 times height of head; length of eye in dorsal view 2.0 times temple (fig. 27);  $POL:diameter\ of\ ocellus:OOL = 6:5:11$ ; face and clypeus rather irregular and coarsely punctate, with interspaces usually about equal to diameter of punctures or less; face with small tubercle medio-dorsally; area between lamellae connected to antennal sockets wide anteriorly (fig. 27); frons sparsely punctate laterally, smooth, and slightly concave medially; vertex narrow, sparsely punctate; occipital flange and eye large (fig. 25); ocelli protruding above stemmaticum (fig. 69).

**Mesosoma.**— Length of mesosoma 1.4 times its height; sides of pronotum largely

smooth, with fine crenulae posteriorly; epomia single, subpronope deep (fig. 28) and pronope absent; precoxal sulcus coarsely crenulate and crenulae short; area above precoxal sulcus finely punctate, below sulcus densely and coarsely rugose-punctate; middle lobe of mesoscutum protuberant dorsally, with pair of longitudinal depressions anteriorly and largely coarsely punctate; lateral lobes of mesoscutum with coarse rugae but medially largely smooth; notauli complete and largely smooth; scutellum rather flat, coarsely punctate, with anterior and lateral carinae weak or obsolescent (fig. 31), its crescentic posterior carina strong; metapleuron normally long setose, and largely sparsely punctate; propodeum moderately strongly areolate, less than e.g. in *E. magnifica*.

Wings.— Fore wing: second submarginal cell subtriangular, and with ramellus (fig. 24);  $r:3-SR:SR1 = 6:1:64$ ;  $SR1$  virtually straight;  $2-SR:3-SR:r-m = 14:1:10$ ;  $cu-a$  slightly inclivous (fig. 24). Hind wing:  $M+CU:1-M = 9:20$ ;  $2-SC+R$  vertical (fig. 24).

Legs.— Hind leg long; length of femur, tibia, and basitarsus of hind leg 6.3, 9.8, and 10 times their width, respectively; length of outer and inner spurs of middle tibia 0.4 and 0.6 times middle basitarsus, respectively; length of outer and inner spurs of hind tibia 0.25 and 0.5 times hind basitarsus, respectively; inner hind spur very robust.

Metasoma.— Length of first tergite 1.6 times its apical width, deeply concave basally, smooth, but medio-laterally depressed and crenulate (fig. 26); remainder of metasoma smooth and glabrous, except for subapical row of setae on tergites; ovipositor sheath rather robust (fig. 30) and its length 0.05 times fore wing.

Colour.— Black; head, scapus, pedicellus, tegulae, palpi, fore and middle legs, and mesosoma (except metapleuron, propodeum and metanotum largely) reddish-brown; wing membrane, pterostigma, and veins dark brown (fig. 24).

Variation.— Antennal segments of female 53(1), 54(2) or 55(1); length of fore wing 12.2–14.5 mm, length of ovipositor sheath 0.05–0.07 times fore wing; length of first metasomal tergite 1.6–1.8 times its apical width; anterior and lateral carinae of scutellum may be distinct.

Note.— Runs in the key by Bhat & Gupta (1977) to *E. punctata* Szépligeti, 1902 from Sulawesi and to *E. rufonigra* Enderlein, 1920 from the Sunda area. For the separation from the first species mentioned, see the key in this paper. *Euagathis rufonigra* has the first metasomal tergite, face and mesoscutum smooth, the scutellum moderately punctate only, ramellus of second submarginal cell of fore wing absent, and the grooves on the middle lobe of mesoscutum obsolescent.

***Euagathis subpilosa* spec. nov.**  
(figs. 16–23)

Material.— Holotype, ♀ (RMNH), "Indonesia: N. Sulawesi, ca 100 m, Tangkoko-Dua Saudara N.R., 1°30'N 125°10'E, 28.xi.1985, C.v.Achterberg, RMNH '86". Paratypes: 2 ♂♂ (RMNH, MZB), "Indonesia: N. Sulawesi, 20 km N. Bitung; Tangkoko N.P., 200 m, 1°34'N 125°12'E, 19.iv.1988, R. Hensen".

Holotype, ♀, length of fore wing 14.6 mm, of body 10.4 mm.

Head.— Antennal segments 60, length of third segment 1.1 times fourth segment, length of third, fourth and penultimate segments 3.0, 2.7 and 1.3 times their width, respectively; length of maxillary palp 0.8 times height of head; length of eye

in dorsal view 2.2 times temple; POL:diameter of ocellus:OOL = 3:3:10; face finely punctate; vertex smooth, and stemmaticum not protruding in lateral view (fig. 22), depression behind antennal sockets wide (fig. 17); area between lamellae connected to antennal sockets narrow (fig. 17); occipital flange large and angularly protruding (fig. 16).

**Mesosoma.**— Length of mesosoma 1.4 times its height; pronope present (figs. 21, 23); pronotal sides punctulate, with posterior crenulation indistinct; epomia double, and subpronope deep and large (figs. 19, 23); precoxal sulcus well impressed, and with long and large crenulae (fig. 18); area above precoxal sulcus punctulate, and coarsely punctate below it; mesoscutum distinct tuberculate (fig. 19), punctulate, and without medio-posterior depression, middle lobe with two short longitudinal depressions antero-medially (fig. 21); notauli shallow; scutellum punctate (especially anteriorly), with carinae all around its edges, and with a distinct short, longitudinal carina medio-posteriorly (fig. 20); metapleuron punctate and very densely setose (fig. 18); propodeum areolated, but areolation somewhat reduced posteriorly.

**Wings.**— Fore wing: second submarginal cell triangular;  $r:3-SR:SR1 = 10:5:160$ ;  $2-SR:3-SR:r-m = 22:5:16$ ; cu-a basally curved and slightly postfurcal. Hind wing:  $M+CU:1-M = 1:2$ .

**Legs.**— Length of hind femur, tibia and basitarsus 6.8, 10.5 and 11.0 times their width, respectively; length of outer and inner spurs of middle tibia 0.4 and 0.5 times middle basitarsus, respectively; length of outer and inner spurs of hind tibia 0.2 and 0.4 times hind basitarsus.

**Metasoma.**— Smooth, shiny; length of first tergite 2.4 times its apical width; length of ovipositor sheath 0.07 times fore wing.

**Colour.**— Black; antennae and wing membrane dark brown; head, scapus, pronotum and pronotal sides, mesoscutum, scutellum, mesopleuron and fore coxae dark reddish-brown; fore legs dark reddish-brown, but base of telotarsus brownish; middle coxae dark reddish-brown, but brownish in their distal part; middle legs dark reddish-brown, but apex of tibia and of telotarsus brownish; metapleuron, propodeum, metasoma, hind coxae and legs black.

**Variation.**— Antennal segments 58 (2 females), length of fore wing 13.6-14.6 mm, length of hind femur 6.2-6.8 times its width; length of outer and inner spurs of middle tibia 0.4 and 0.5-0.6 times middle basitarsus, respectively; length of outer and inner spurs of hind tibia 0.2 and 0.4 times hind basitarsus, respectively; length of ovipositor sheath 0.07-0.08 times fore wing.

***Euagathis vermiculata* spec. nov.**  
(figs. 32-39)

**Material.**— Holotype, ♂ (RMNH), "Indonesia: N. Sulawesi, Dumoga-Bone N.P., ca 220 m, nr Base Camp, Toraut R., 0°34'N 123°54'E, 2.xi.1985, C.v.Achterberg, RMNH'85".

Holotype, ♂, length of fore wing 12.7 mm, of body 11.0 mm.

**Head.**— Antennal segments 50, length of third segment 1.1 times fourth segment, length of third, fourth and penultimate segments 3.3, 3.0 and 1.3 times their width, respectively; length of maxillary palp 0.8 times height of head; length of eye in dorsal view 2.6 times temple; POL:diameter of ocellus:OOL = 4:2:10; face flat, fine-

ly punctate, slightly depressed and with pair of crests laterally, the smallest near the edges; depression behind antennal sockets very shallow (fig. 35); vertex rugose-vermiculate (fig. 35), and with stemmaticum distinctly protruding (fig. 36) and with a distinct small depression behind stemmaticum (fig. 35); occipital flange comparatively narrow (fig. 33).

**Mesosoma.**— Length of mesosoma 1.4 times its height; pronotal sides punctulate, with some rugae anteriorly and with distinct crenulation postero-ventrally; subpronope medium-sized and single epomia moderately developed (figs. 34, 38); mesopleuron coarsely punctate, precoxal sulcus very well impressed, with crenulae short and narrow (fig. 34); mesoscutum with deep, vermiculate depression medio-posteriorly (fig. 39), middle lobe rugose-vermiculate, and lateral lobes vermiculate (inner part) to punctate (outer part); notauli deep and crenulate; scutellum rugose-punctate, moderately convex, and with microcrenulae marginally (fig. 37); metapleuron coarsely punctate, scarcely setose, and with superficial vermiculation antero-ventrally (fig. 34); propodeum strongly areolated, with a very deep antero-medial depression.

**Wings.**— Fore wing: second submarginal cell subquadrangular (fig. 32); r:3-SR:SR1 = 10:3:114; SR1 straight; 2-SR:3-SR:r-m = 20:3:18; Hind wing: M+CU:1-M = 20:39.

**Legs.**— Length of hind femur, tibia and basitarsus 5.8, 8.9 and 9.4 times their width, respectively; length of outer and inner spurs of middle tibia 0.5 and 0.65 times middle basitarsus; length of outer and inner spurs of hind tibia 0.3 and 0.5 times hind basitarsus, respectively.

**Metasoma.**— Smooth, shiny; length of first tergite 2.2 times its apical width.

**Colour.**— Black; antennae, scapus and wings membrane dark brown; face, pronotum and pronotal sides, fore and middle coxae and legs dark reddish-brown; mesopleuron reddish-brown and precoxal sulcus dark brown.

### Excluded species

#### *Zelomorpha penetrans* (Smith, 1861) comb. nov.

*Agathis penetrans* Smith, 1861: 66 (nec *Euagathis penetrans* sensu Bhat & Gupta, 1977: 225-226, figs. 29b, 31h from Halmahera).

*Euagathis sulana* Enderlein, 1920: 174. **Syn. nov.**

*Zelomorpha sulana*; Bhat & Gupta, 1977: 254-255 (redescription).

**Material.**— Holotype, ♀ (OM), "Mak." [= SW. Sulawesi, Ujung Pandang], "*Agathis penetrans* Smith".

The type of *Z. penetrans* has the hind leg (except coxa and trochanter) missing; inner tibial spur of middle leg as long as middle basitarsus; the anterior ocellus distinctly below level of posterior ocelli and smaller than posterior ocellus; the head slightly less long than in similar *Euagathis*; the precoxal sulcus complete; the parastigmal patch absent; the short dorsal carinae of first metasomal tergite present; cu-a of fore wing interstitial. Judging from the redescription of *Z. sulana* the holotype of *Z. penetrans* is conspecific with this species known from Sula Besi (=Salana, Sula Islands, fig. 15). *Euagathis penetrans* sensu Bhat & Gupta, 1977 may be a synonym of *E. elevatus* Bhat & Gupta, 1977.

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We wish to thank Messrs. G. Nishida and K. Arakaki (Bernice P. Bishop Museum, (BPBM), Honolulu), Dr J. Papp (Zoological Museum, (TMA), Budapest), Dr M.W.R. de Vere Graham and Mr C. O'Toole (Hope Department, (OM), Oxford), Dr M. Sharkey (Canadian National Collection, (CNC), Ottawa) for making types available; Mr R.V. Hensen (Utrecht) for the gift of valuable additional material; Mr S. Kahono (Museum Zoologi Bogor, (MZB), Bogor, Dr Ir J. Warouw & Ir M. Tulung (Sam Ratulangi University, Manado), Messrs. I. Ladamay, T. Pakki, and I.M. Ebeneser (Haluoleo University, Kendari) for their assistance during the fieldwork in Sulawesi. The abbreviation RMNH stands for the Nationaal Natuurhistorisch Museum (Rijksmuseum van Natuurlijke Historie), Leiden. Mr T. Huddleston (Natural History Museum, London) supplied useful comments on the first draft of this paper.

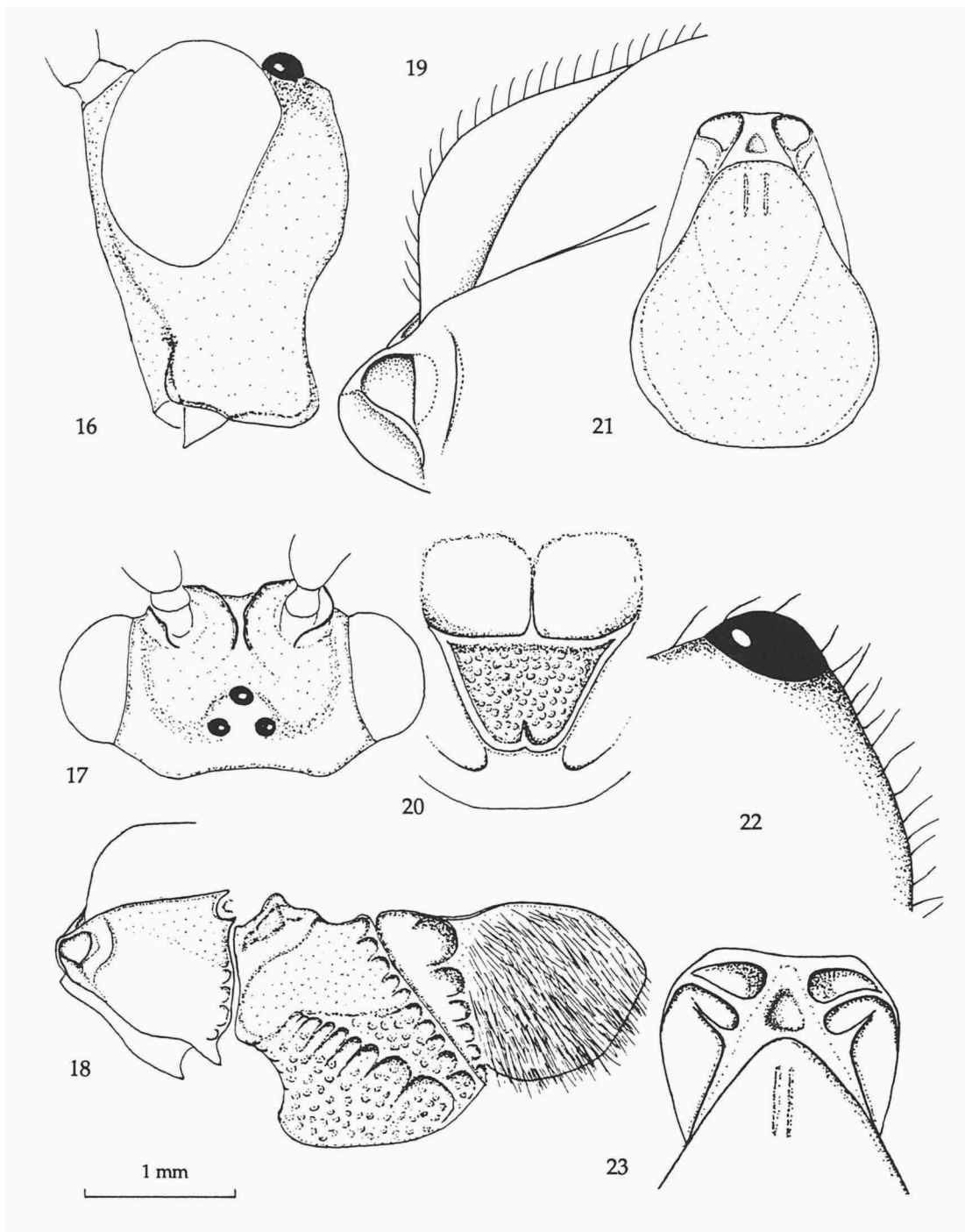
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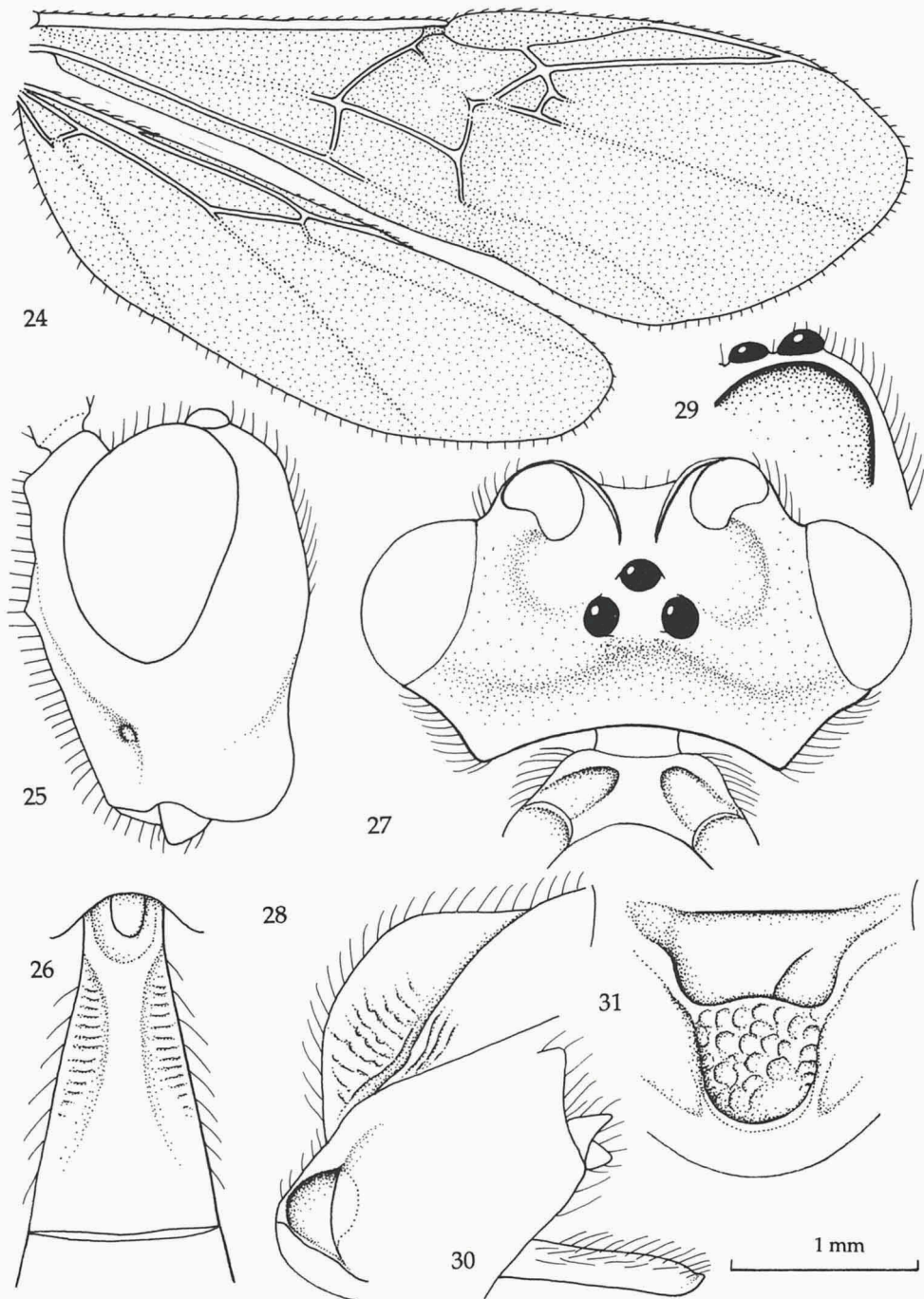
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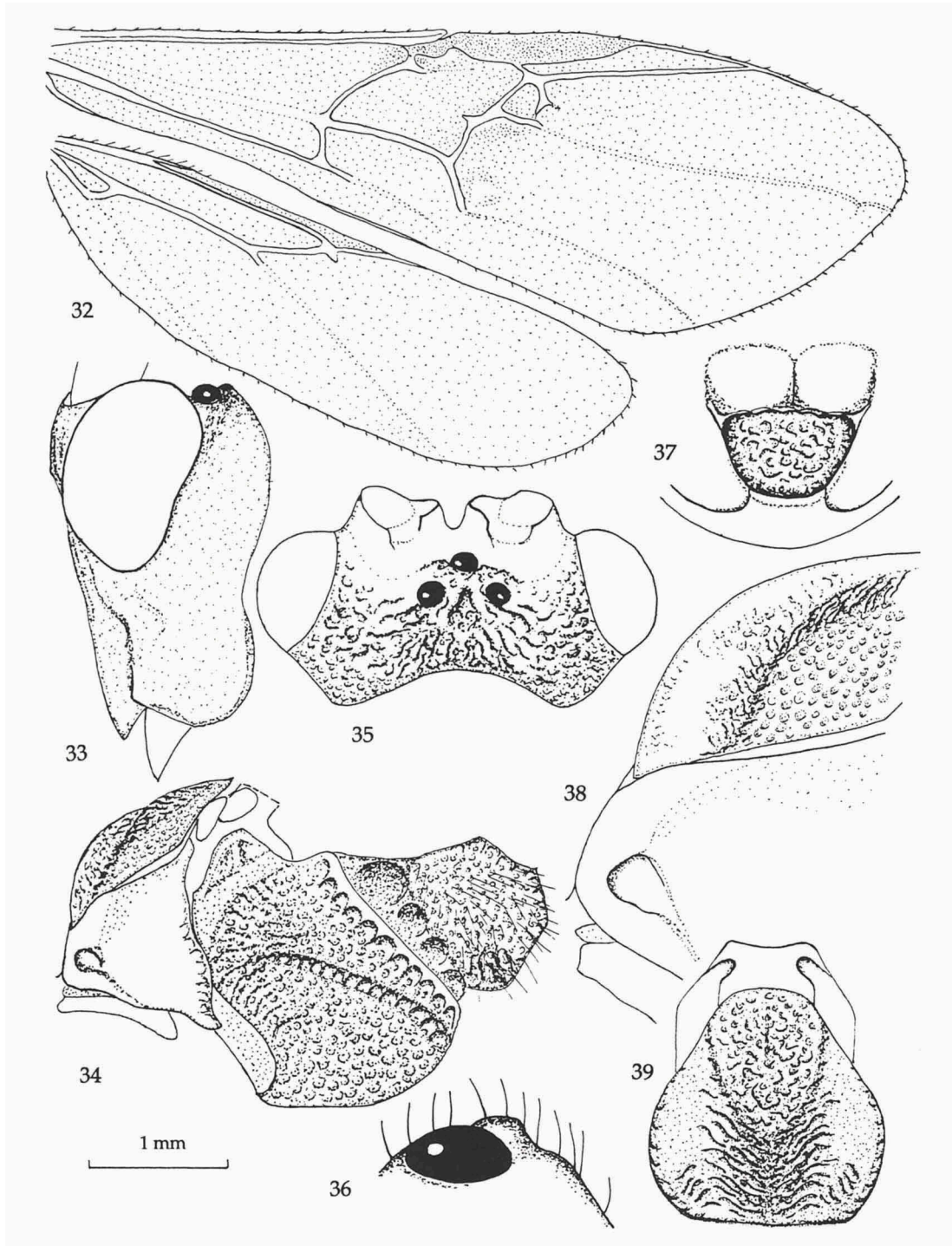


Figs. 16-23, *Euagathis subpilosa* spec. nov., ♀, holotype. 16, head, lateral aspect; 17, head, dorsal aspect; 18, mesosoma, lateral aspect; 19, pronotum and mesoscutum anteriorly, lateral aspect; 20, scutellum, dorsal aspect; 21, pronotum and mesoscutum, dorsal aspect; 22, stemmaticum, lateral aspect; 23, pronotum, dorsal aspect. 16: 1.4 ×; 17, 18, 20, 21: scale-line (= 1 ×); 19: 2.3 ×; 22, 23: 2 ×.

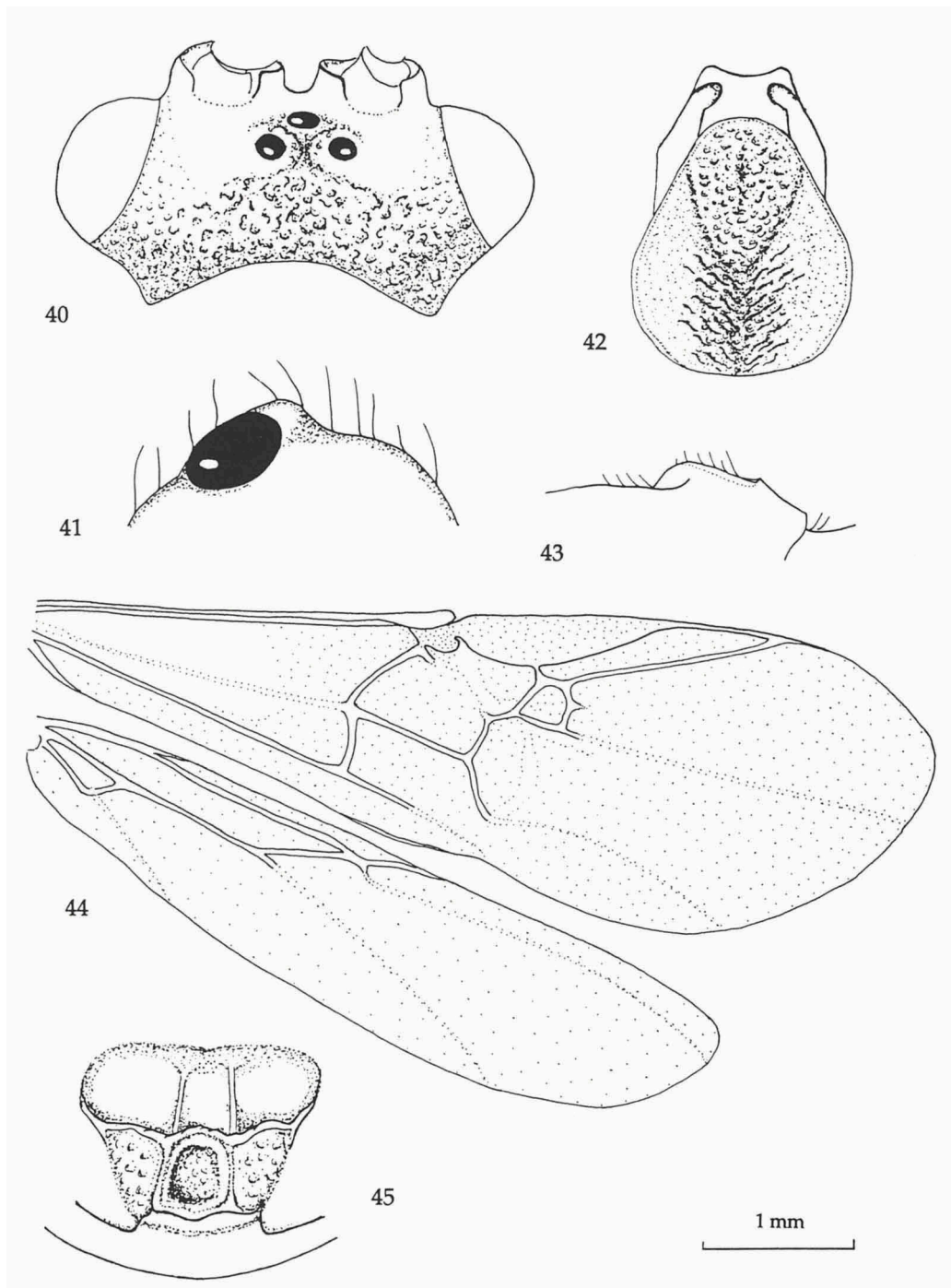


Figs. 24-31, *Euagathis rufoscapa* spec. nov., ♀, holotype. 24, wings; 25, head, lateral aspect; 26, first metasomal tergite, dorsal aspect; 27, head, dorsal aspect; 28, pronotum and mesoscutum anteriorly, lateral aspect; 29, stigmaticum, lateral aspect; 30, ovipositor sheath, lateral aspect; 31, scutellum, dorsal aspect. 24: 0.3 ×; 25, 27-31: 2 ×; 26: scale-line (= 1 ×).

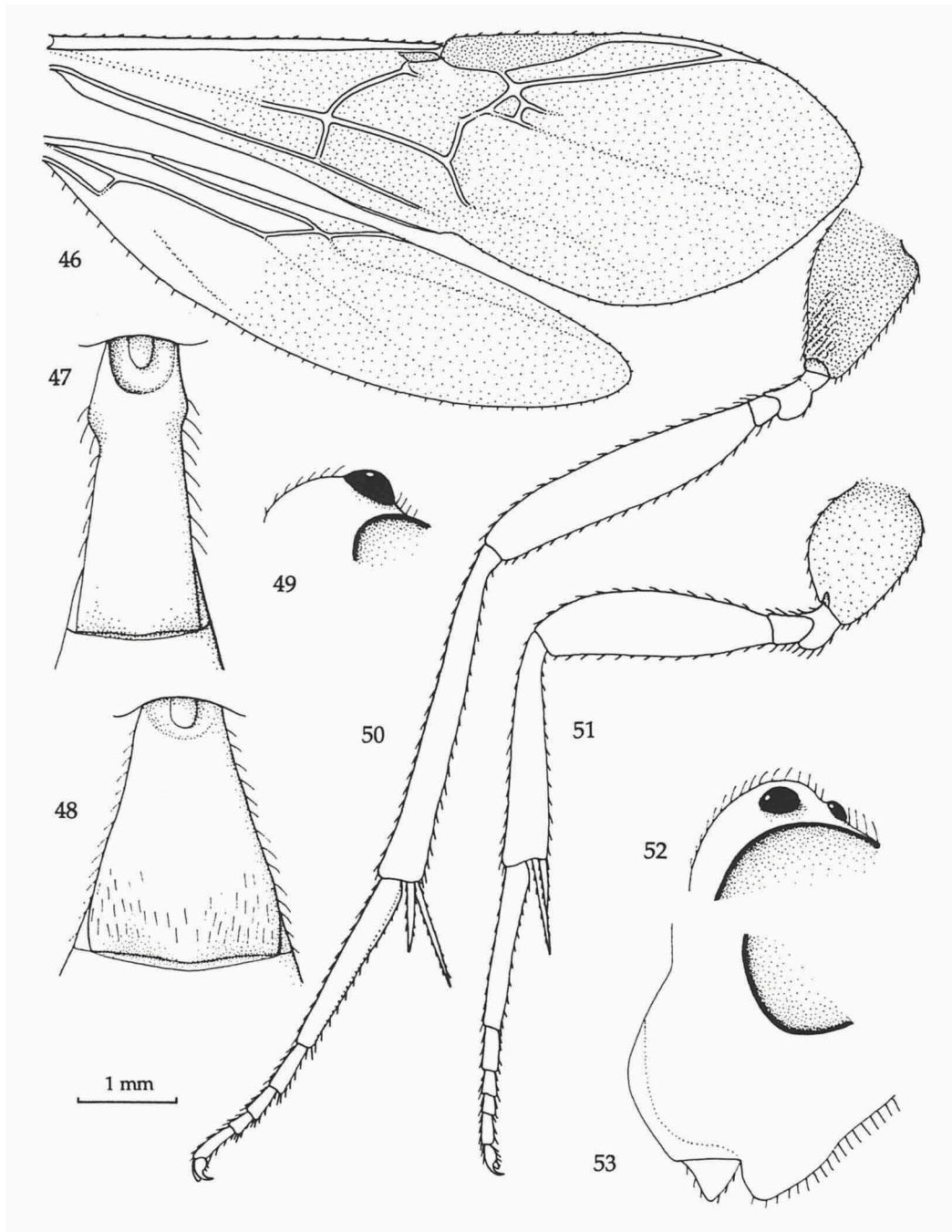




Figs. 32-39, *Euagathis vermiculata* spec. nov., ♀, holotype. 32, wings; 33, head, lateral aspect; 34, mesosoma, lateral aspect; 35, head, dorsal aspect; 36, stigmaticum, lateral aspect; 37, scutellum, dorsal aspect; 38, mesoscutum and pronotum, lateral aspect; 39, mesoscutum, dorsal aspect. 32: 0.2 ×; 33: 1.4 ×; 34, 39: 0.5 ×; 35, 37, 38: scale-line (= 1 ×); 36: 3.3 ×.

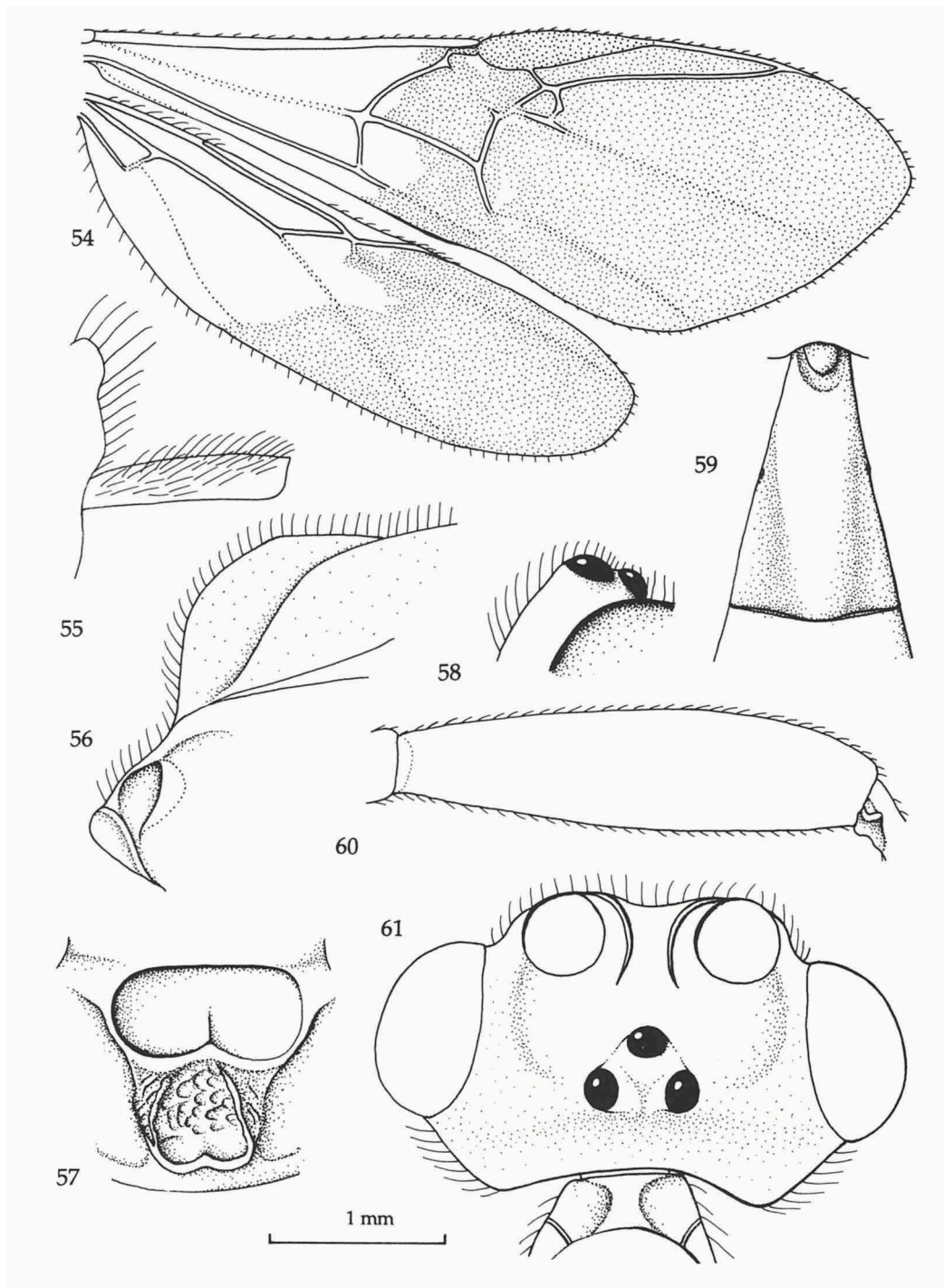


Figs. 40-42, *Euagathis punctata* Szépligeti, ♀, lectotype; figs. 43-45, *E. minuta* spec. nov., ♀, holotype. 40, head, dorsal aspect; 41, stemmaticum, lateral aspect; 42, mesoscutum, dorsal aspect; 43, scutellum, lateral aspect; 44, wings; 45, scutellum, dorsal aspect. 40: scale-line (= 1 ×); 41: 2 ×; 42: 0.6 ×; 43, 45: 1.3 ×; 44: 0.8 ×.

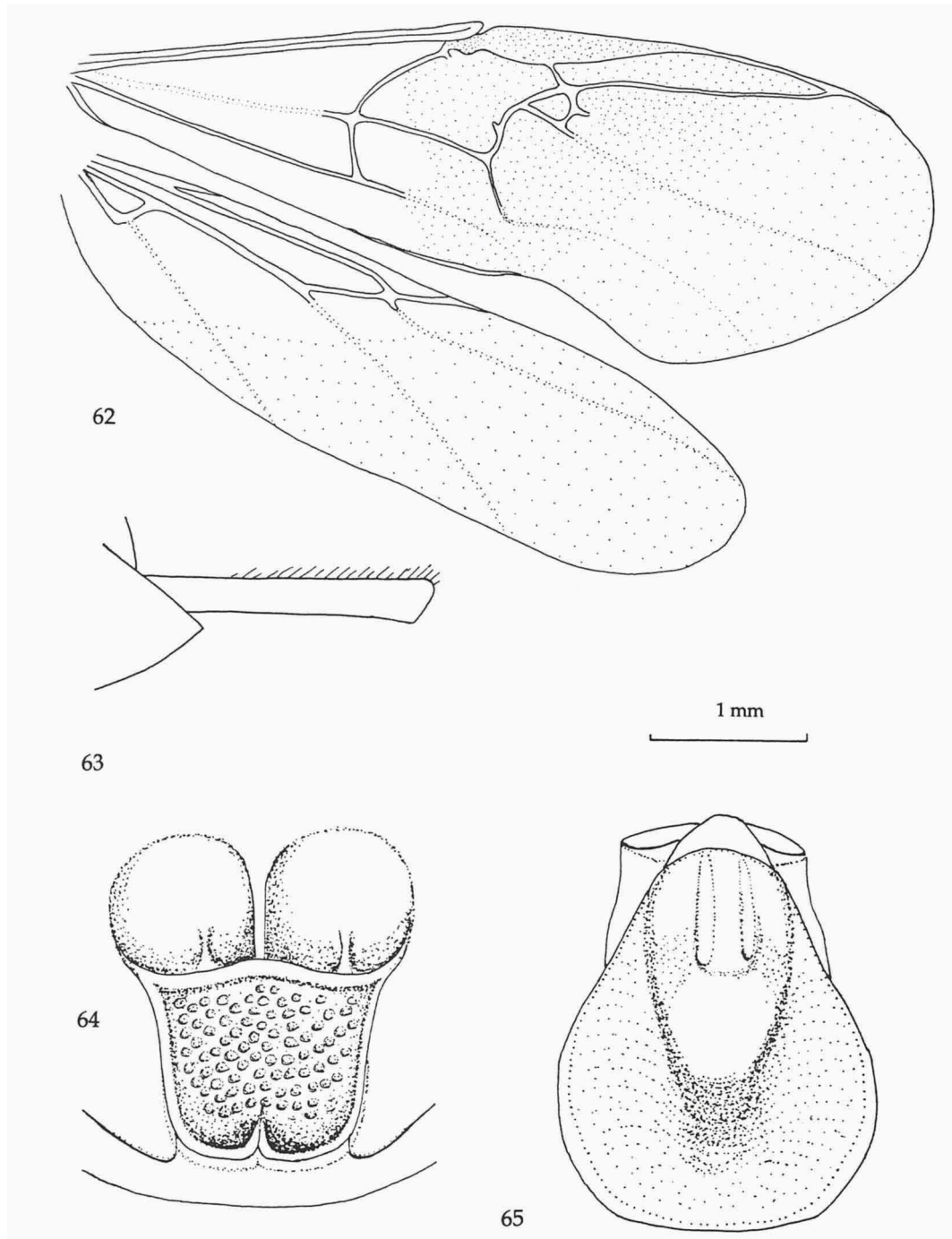


Figs. 46, 47, 50, 52, 53, *Euagathis paraminuta* spec. nov., ♀, holotype; 48, 49, 51, *E. minuta* spec. nov., ♀, holotype. 46, wings; 47, 48, first metasomal tergite, dorsal aspect; 49, 52, stemmaticum, lateral aspect; 50, 51, hind leg; 53, occipital flange, lateral aspect. 46, 50: scale-line (= 1 ×); 47, 48: 1.6 ×; 49, 52, 53: 3.3 ×; 51: 1.1 ×.

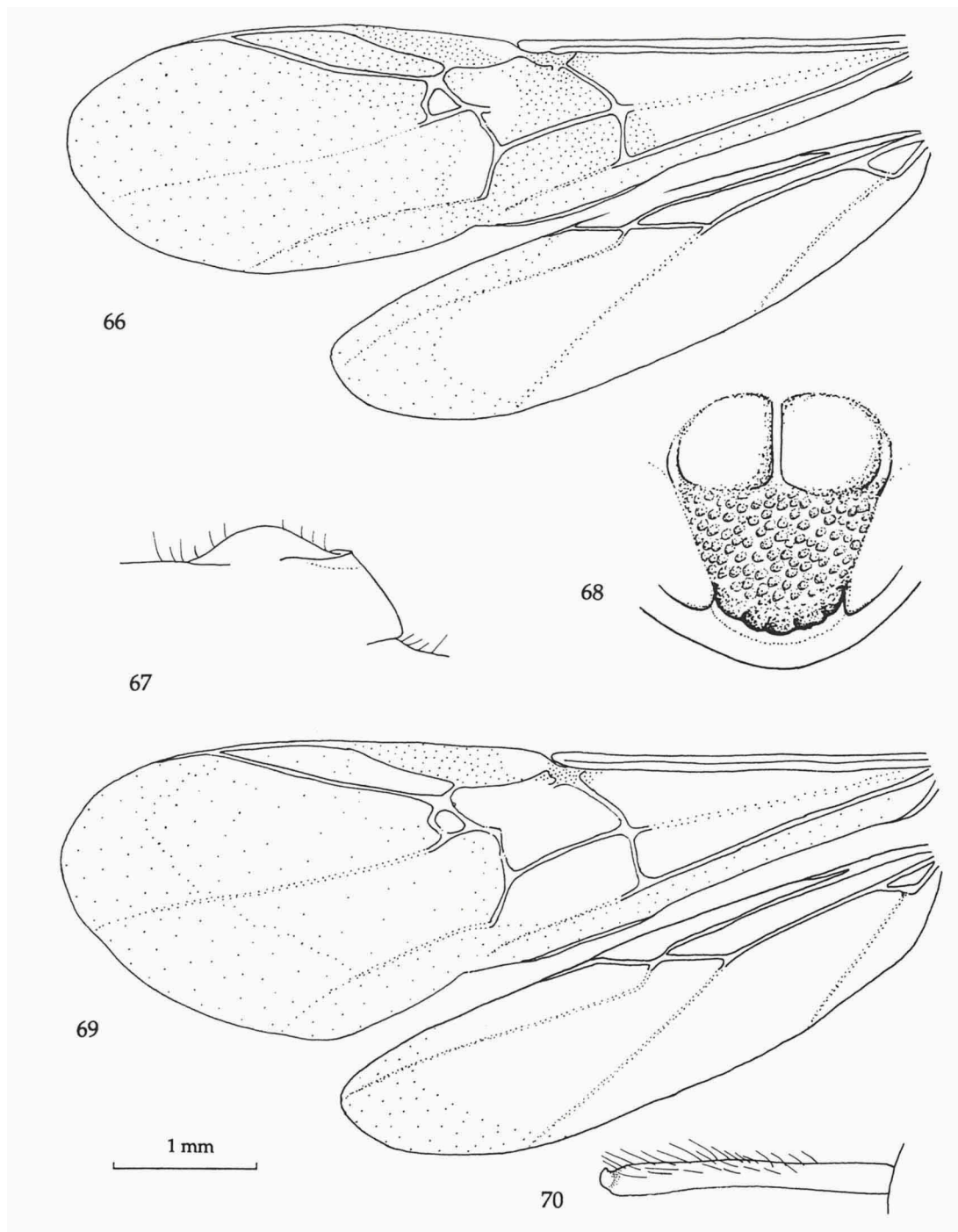




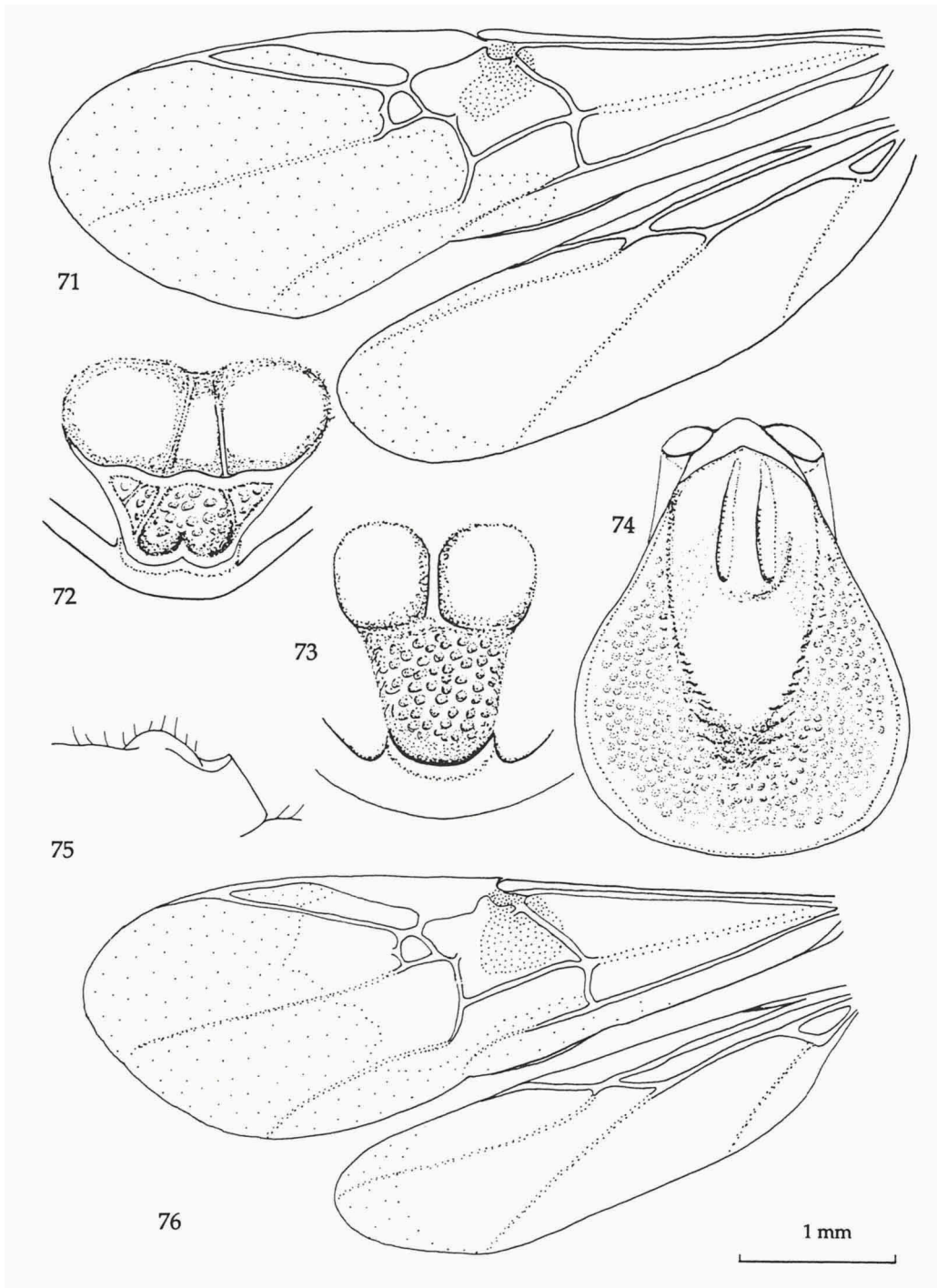
Figs. 54-61, *Euagathis magnifica* spec. nov., ♀, holotype. 54, wings; 55, ovipositor sheath, lateral aspect; 56, pronotum and mesoscutum, lateral aspect; 57, scutellum, dorsal aspect; 58, stemmaticum, lateral aspect; 59, first metasomal tergite, dorsal aspect; 60, hind femur, lateral aspect; 61, head, dorsal aspect. 54: 0.3 ×; 55-58, 61: 2 ×; 59, 60: scale-line (= 1 ×).



Figs. 62-64, *Euagathis flava* Szépligeti, ♀, holotype; 65, *E. fuscinervis* spec. nov., ♀, holotype. 62, wings; 63, ovipositor sheath, lateral aspect; 64, scutellum, dorsal aspect; 65, mesoscutum, dorsal aspect. 62: scale-line (= 1 ×); 63: 2.6 ×; 64: 3.4 ×; 65: 2.4 ×.

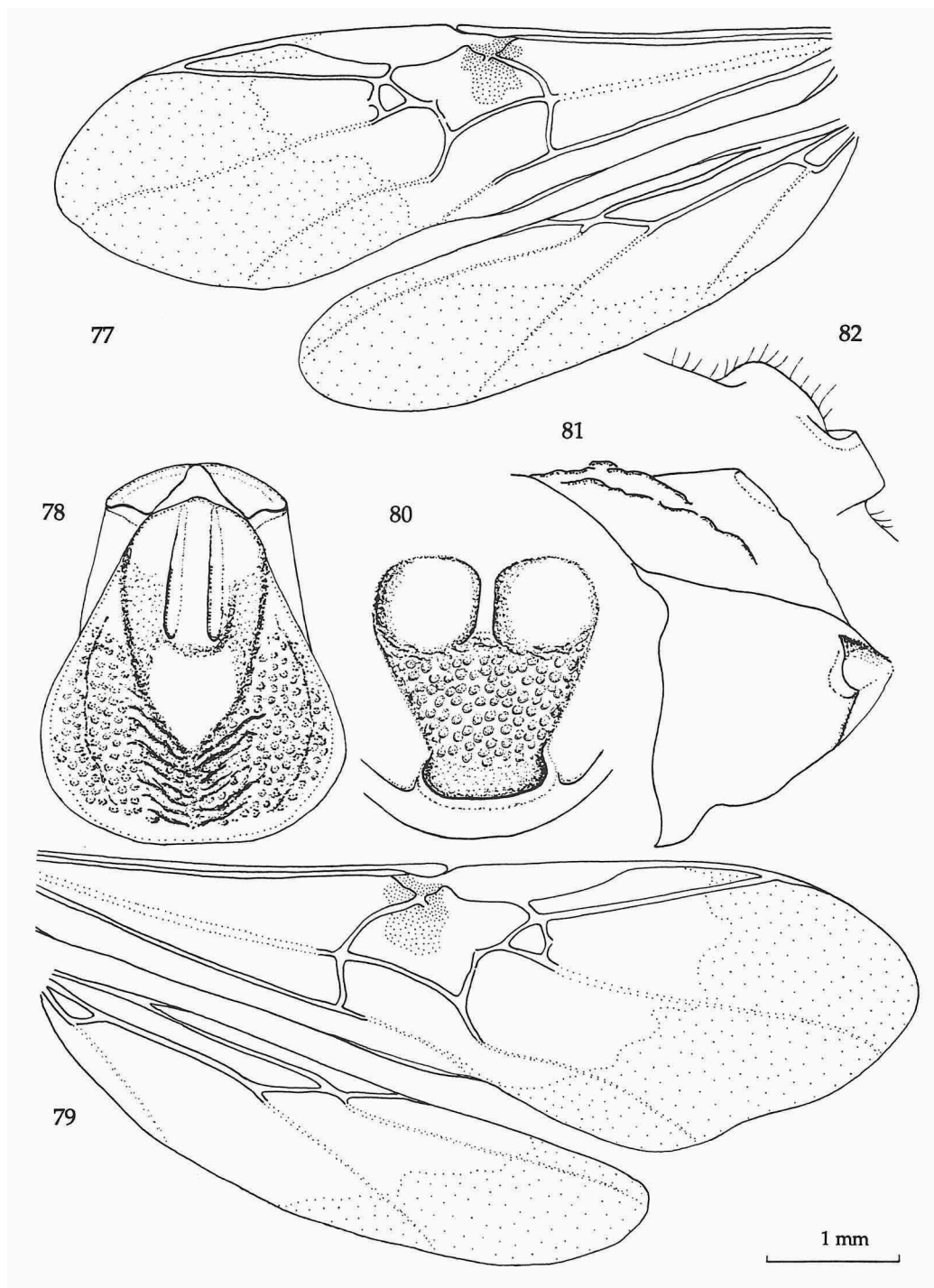


Figs. 66-70, *Euagathis fuscineris* spec. nov., ♀, holotype, but 69 of ♂, paratype. 66, 69, wings; 67, scutellum, lateral aspect; 68, scutellum, dorsal aspect; 70, ovipositor sheath, lateral aspect. 66, 69: scale-line (= 1 ×); 67, 68: 3.4 ×; 70: 2.4 ×.



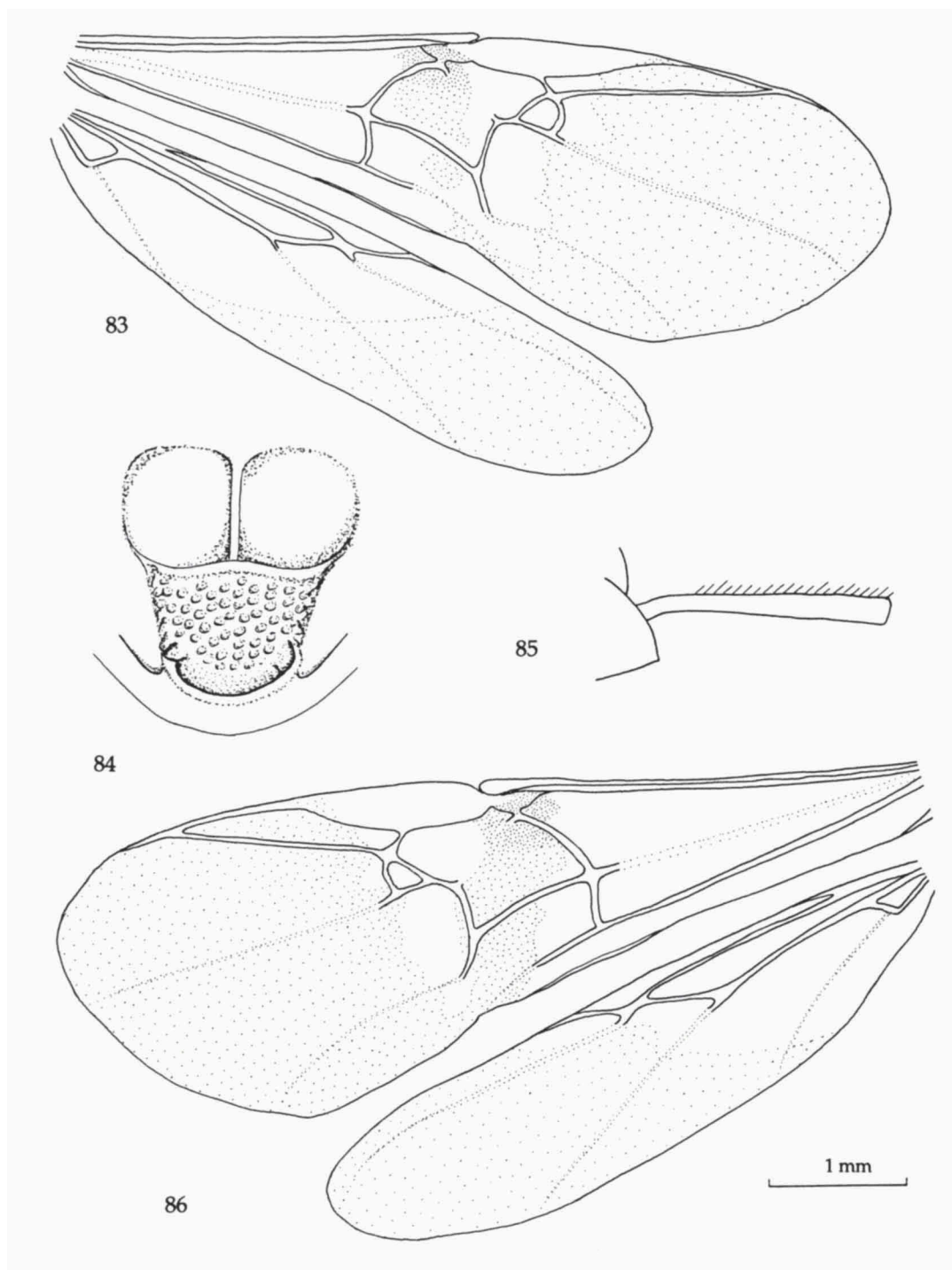
Figs. 71, 72, *Euagathis elevatus* Bhat & Gupta, ♀, holotype; 73-76, *E. forticarinata* (Cameron), ♀, holotype of *E. pallida* Fullaway. 71, 76: wings; 72, 73, scutellum, dorsal aspect; 74, mesoscutum, dorsal aspect; 75, scutellum, lateral aspect. 71, 76: scale-line (= 1 ×). 72, 73, 75: 3.4 ×; 74: 0.9 ×.





Figs. 77-82, *Euagathis lorensis* spec. nov., ♀, holotype, but 77 of ♂, paratype. 77, 79, wings; 78, mesoscutum, dorsal aspect; 80, scutellum, dorsal aspect; 81, pronotum and mesoscutum, lateral aspect; 82, scutellum, lateral aspect. 77, 79: scale-line (= 1 ×); 78: 0.9 ×; 80: 3.4 ×; 81, 82: 1.3 ×.





Figs. 83-86, *Euagathis flavicornis* spec. nov., ♀, holotype, but 86 of ♂, paratype. 83, 86, wings; 84, scutellum, dorsal aspect; 85, ovipositor sheath, lateral aspect. 83, 86: 0.6 ×; 84: 1.3 ×; 85: scale-line (= 1 ×).